THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1972.] LONDON, FEBRUARY 26, 1901. [53RD YEAR. PRICE 6d.

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(NOT INFRINGEMENTS).
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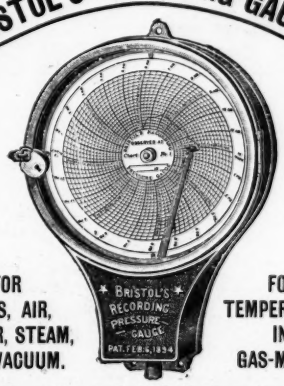

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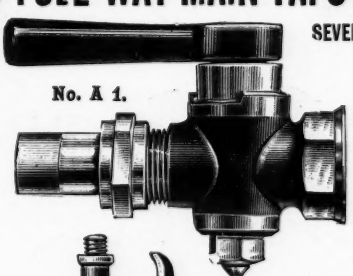
FULL-WAY MAIN TAPS & LANTERN TAPS.
SEVERAL DESIGNS SHOWN BELOW.

No. A.

No. A 1.


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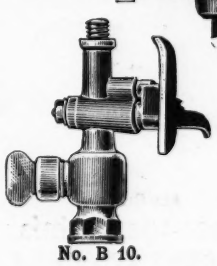
FULL-WAY
AS SHOWN.
SUPERIOR QUALITY AND FINISH IN GUN METAL.

LANTERN TAPS.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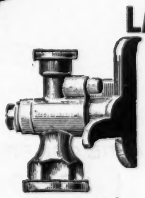
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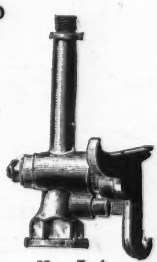
No. A 12.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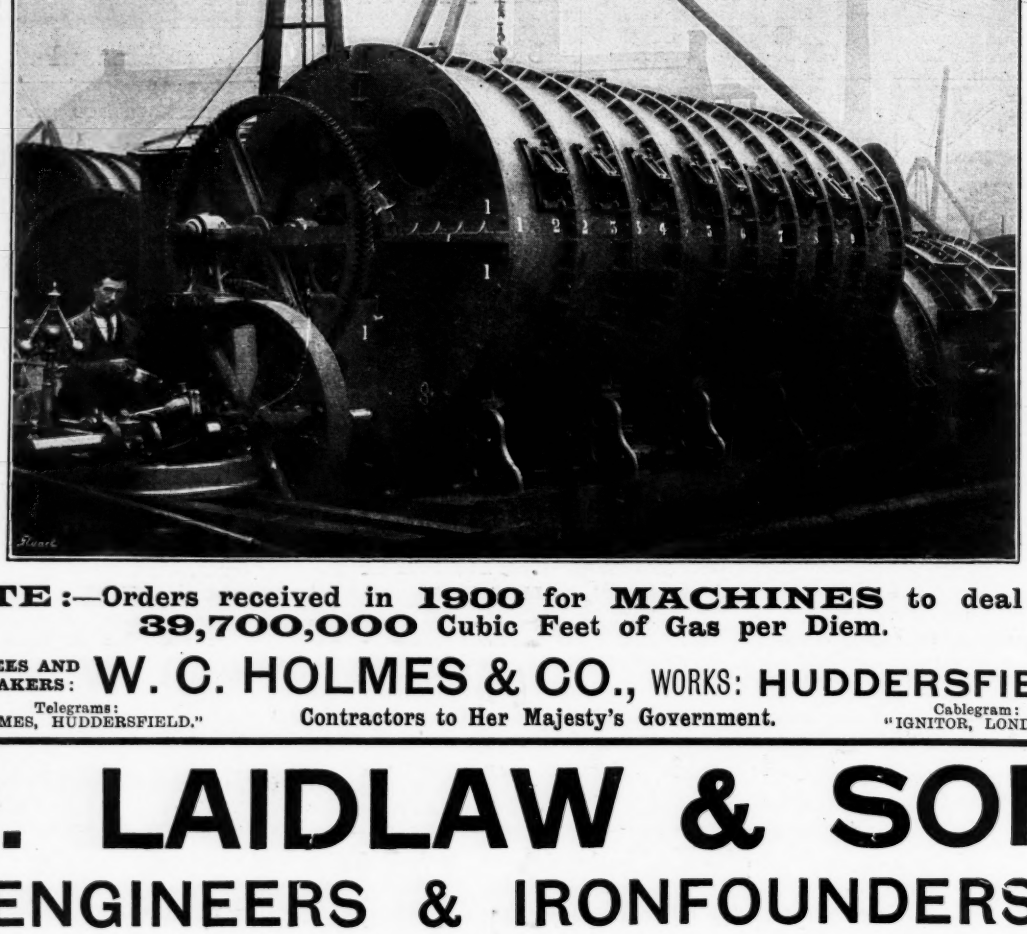

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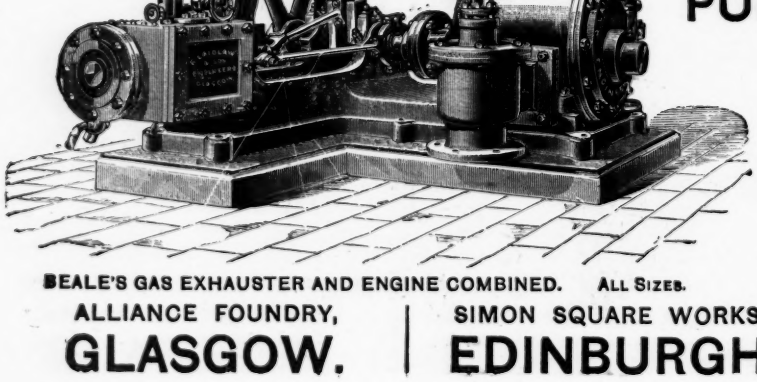

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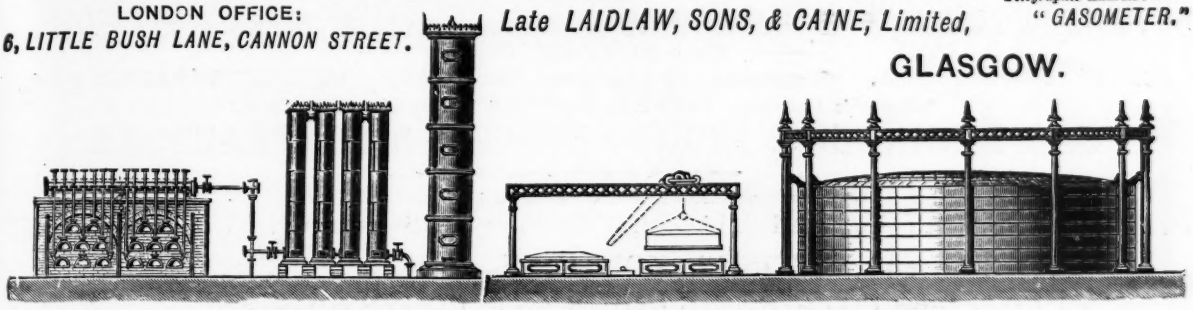

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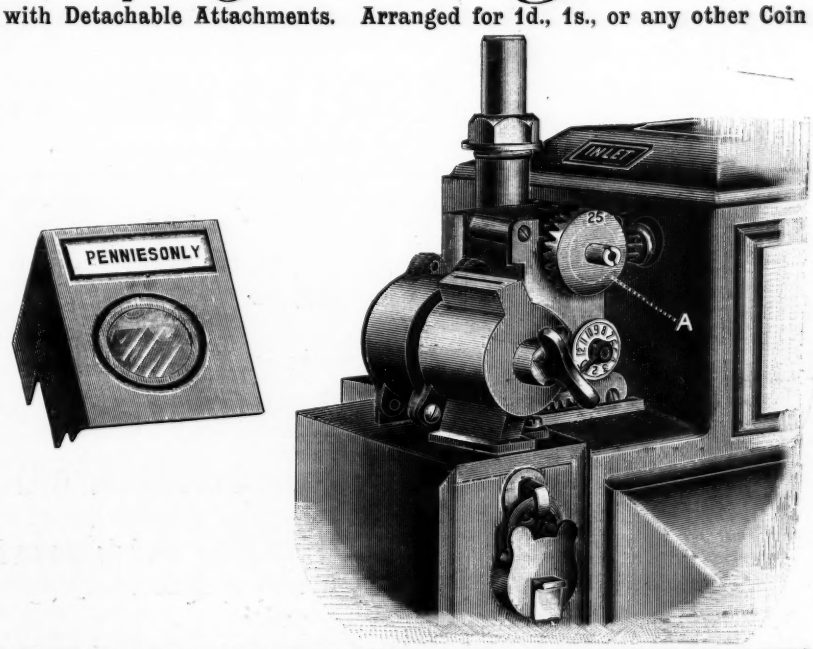

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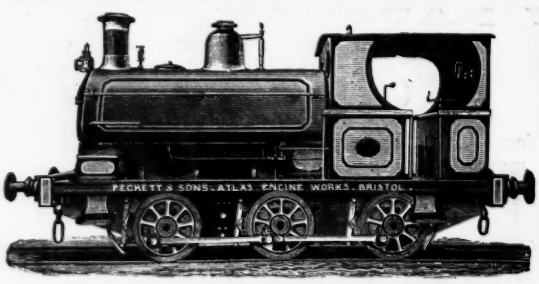

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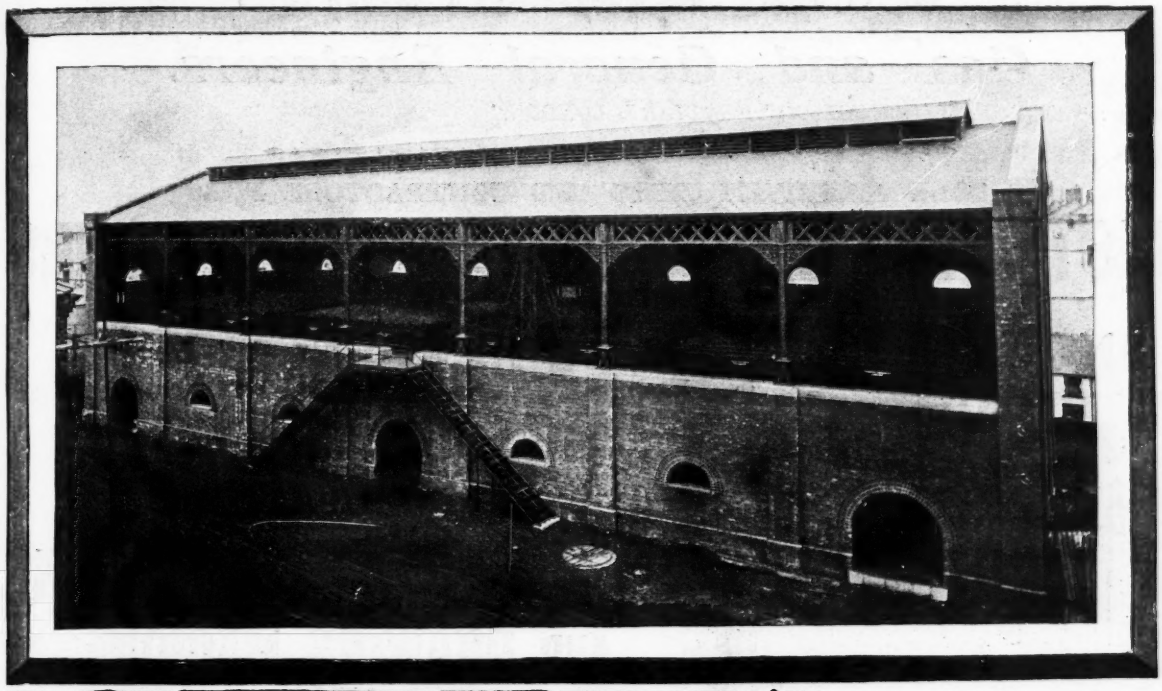

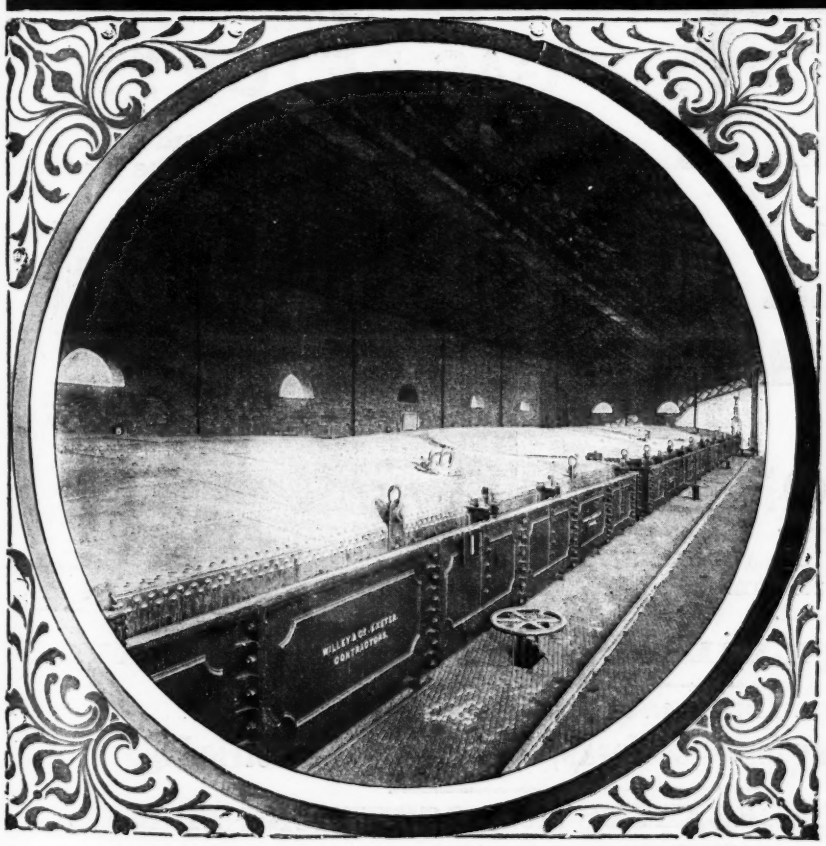

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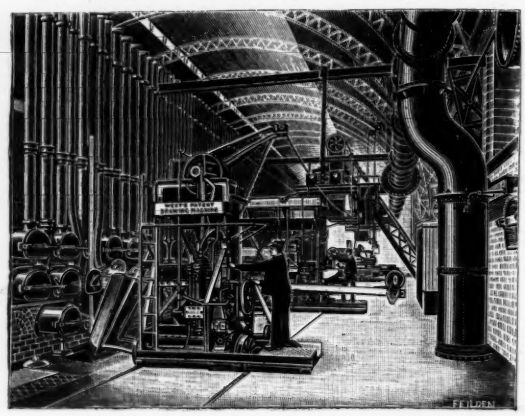

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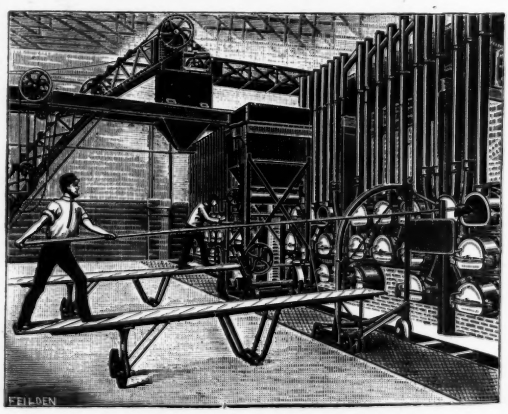

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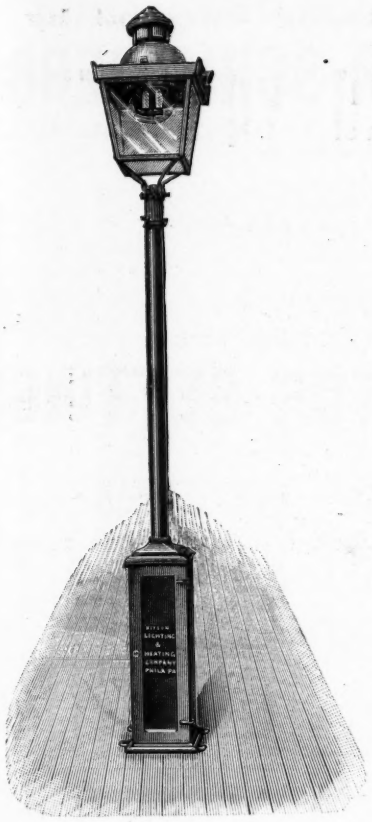

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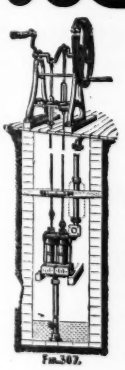

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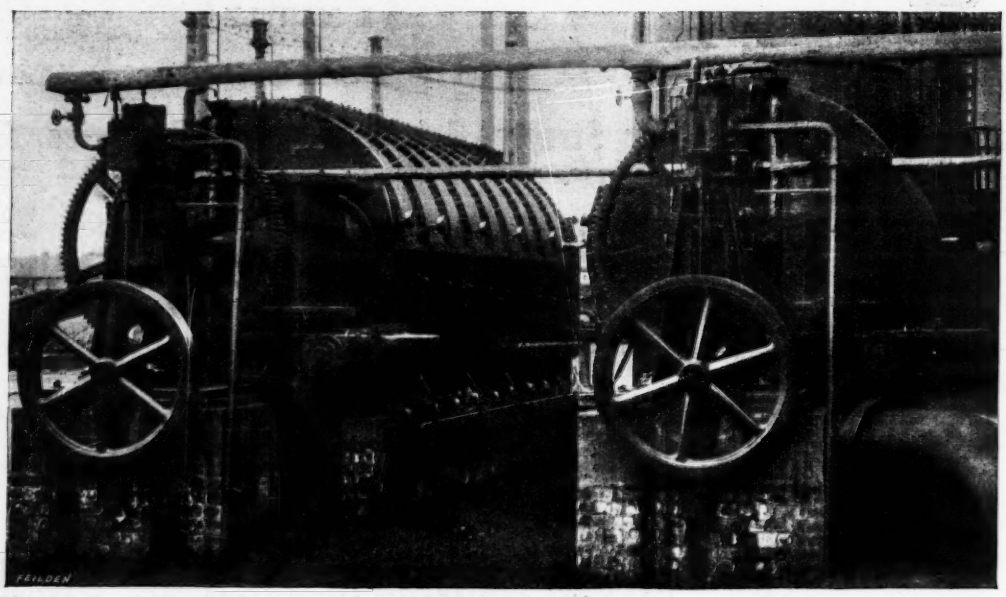

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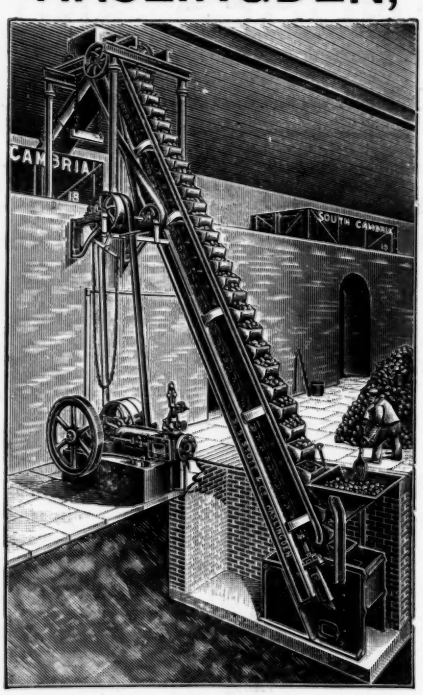

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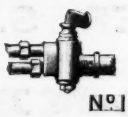

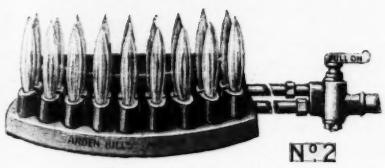

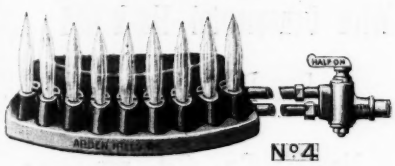

No. 1. Tap off.
No. 2. Burner and Tap full on.
No. 3. Showing position of Lever in Tap when three quarter on.
No. 4. Burner and Tap half on.

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PATENT "ACME" DUAL BURNER AND TRIPLEX TAP,

WHICH IS FITTED IN

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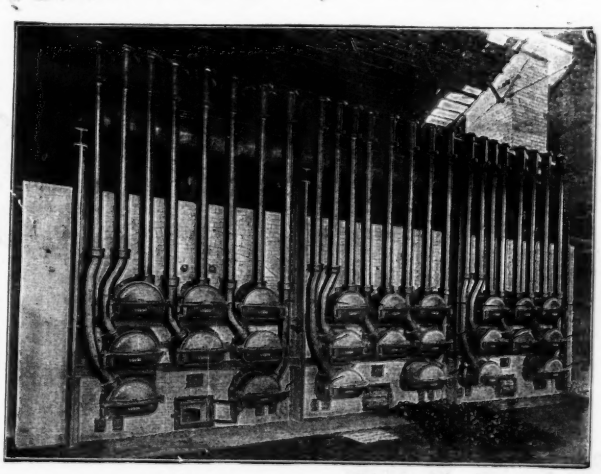

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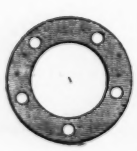

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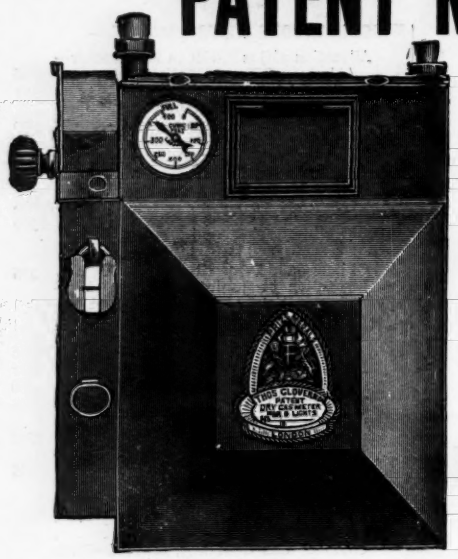

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES.

The Prospects of the Mond Gas Scheme.

STUDENTS of classical literature will recall the luminous incident in the immortal history of the Celebrated Jumping Frog of Calaveras County, when the Stranger, inspecting the hero of the tale, remarked slightingly that "he didn't "see no p'ints in that frog different from any other frog." The observation is recalled by everything that has transpired of late in regard to the "Mond Gas Boom." The Mechanical Engineers held meeting after meeting, with the laudable design of allowing Mr. H. A. Humphrey's paper on Mond gas in relation to large gas-engines to be adequately discussed. Never was such a big palaver over an engineering paper. It was not the fault of the author, nor of the Institution, that the discussion went off into something very like a wrangle over the merits of different makes of gas-engines, which was not the main issue. The only speaker of the whole batch of commentators who really went to the root of the matter was Mr. E. B. Ellington; and he could do little to clear up the mystery of the Mond project, because the complete data were not before him. No sooner was this discussion finished, than another aspect of the Mond affair was brought into prominence at Birmingham. This time it was not the paper merits of the gas for creating motive power, but the parliamentary scheme, which demanded attention and claimed applause. We have refrained from criticizing Mr. Humphrey's part of the Mond propaganda here, for various reasons. The chief of these is the very simple one that we have nothing against what is called "Mond "Gas," regarded as a workshop or factory appliance. If manufacturers elect to employ gas power instead of steam power, and to make their own gas for the purpose, the gas industry proper, as we understand its interests and endeavour to represent them, is not affected one jot or tittle. We all know these power gases. They are to be had for the collecting from blast-furnaces; and failing these somewhat elephantine gas-generators, half-a-score of special patterns of producers are available, every one the best. So far, it is exactly the case of the Jumping Frog. So-called "Mond Gas" pretends to have "points" not shared by other makes of the article; but these do not reside in the gas itself as delivered for use in engines or furnaces. There, it is only a fuel gas, like another, of 150 units calorific power per cubic foot. Not even its sponsors and partisans can make anything more of it.

The speciality of Mond gas, therefore, must be in its method of manufacture; and such is indeed the case. It is claimed to be made from "slack" coals having a wide range of quality, so long as they do not coke too strongly; and in the making, the ammonia of the coal is stated to be recovered almost completely. Thus the coal is first carbonized, and the resultant coke gasified; and consequently the whole of the original raw fuel is converted into gas, with ammonia and a little tar as the only residuals. Yet stay—Mr. Bryan Donkin has spoken of sulphur being one residual product competent to defray the prime cost of the coal; and, in some localities, perhaps, even the clinkers and the ashes would be worth something. These considerations serve as a reminder that commercially valuable residual products of coal carbonizing operations are not to be obtained for nothing. Of course, if one puts raw bituminous coal in at one end of a distillatory apparatus, the nature of what comes out at the other end depends entirely upon the character and extent of the intermediary processes. It would be quite possible to develop the Mond, or any other coal carbonizing plant, to the point of showing artificial indigo or saccharin as the residual product that "more than pays for "the coal." Actually, the Mond gas partisans do not go to this extreme; but they do quite as badly in pretending that the sulphate of ammonia alone "pays for the coal." Mr. Ellington pricked this bubble; but, of course, those who are interested in deluding themselves and others will try to ignore the criticism.

Quitting this part of the question, however, and assuming, for the sake of the argument, that Mond gas, washed, clean from dust, and fit for sale, costs absolutely nothing in the holder, what are the prospects of its distribution on the lines indicated in the parliamentary scheme? It begins to accumulate cost from this point. There is the cost of storage; and although it is contended that the amount of gasholder room required will be comparatively small, owing to the facility with which producers can be put in and out of action, there must be some storage to be provided and paid for. Then there will be the cost of compression. Does anybody know what this is likely to be? Next, the mains and services. Mond gas is half nitrogen. It would have to be sent out in from fourfold to fivefold the bulk of ordinary gas to do the same work in engine or forge; and even so, one-half of it is a useless diluent. The Americans know to their cost what this means; and those of them who have ever had experience of distributing fuel gas unite in the cry, "Not any nitrogen in mine, please!" Here is the short point: The cost of gas distribution is reckoned, in the case of ordinary gas-works, on the unit of bulk. It matters not what the quality of the gas is. It is always charged for distribution at so much per 1000 cubic feet. This is for a gas averaging 650 units per cubic foot, with not a morsel of offal. We are not going to say precisely what coal gas should cost to distribute in South Staffordshire, under conditions analogous to those imagined for the Mond scheme. If the promoters of this project wanted gas engineering advice, they could have had it. Not a single gas engineer, so far as we know, has been consulted in regard to the scheme. If this step had been taken, there would probably have been no scheme. It should scarcely require a gas engineer, however, to show that it cannot be much cheaper to distribute at high pressure a gas which is half waste, and of only from one-fourth to one-fifth the heating value of ordinary gas, than to distribute the latter in the usual way.

There was an enthusiastic public meeting in Birmingham last Thursday in support of the Bill. It was well attended; and Sir Alfred Hickman, M.P., and other prominent South Staffordshire magnates gave the scheme their blessing. Mr. Alfred Mond, son of the sponsor of the gas and presumably promoter of the whole affair, spoke in answer to criticisms of the scheme. Among other things, he is reported as having said that those people who concerned themselves with the question of whether the venture would pay, not being asked to put any money into it, had nothing to do with the matter. This is an impertinence. These same people do not overlook the circumstance that Dr. Mond proposes to tax South Staffordshire in perpetuity in consideration of his kindly permitting the working of his patents in the district—patents which have not been sustained by the Courts, and will soon run out. Even so, the Bill now being promoted does not pin the promoters to the Mond process. Supposing the process proves unprofitable, what is likely to be the next move? Capital once sunk does not accept loss without a struggle; and prevention is better than cure. The agreement of the South Staffordshire industrial magnates naturally impresses the "Birmingham Post" as the "best recom-"mendation of the Mond gas scheme." So does it not us. We do not forget the Birmingham Compressed Air Power Scheme, which was similarly and equally well spoken of in its day. The dead mains of this defunct Company might have reverberated to the cheering of Dr. Mond's meeting at the Grand Hotel. Facts are stubborn things; and all the facts pertinent to the main issue are dead against the financial prospects of the scheme embodied in the Mond Gas Bill.

The Milch-Cow of the Manchester Corporation.

AFTER many postponements for various reasons, Alderman Gibson's resolution condemning the present system of subsidizing the Manchester city rate fund out of the profits of the gas undertaking, as being "wrong in principle, unjust "in practice, inimical to the best interests of the rate-"payers," and therefore to be discontinued, has been rejected by the City Council after a debate which must have been "squared" outside; for a more contemptible make-believe discussion surely never attended the mooting of so important a question in that assembly. The member who was put up to answer Alderman Gibson—Councillor Plummer—started with the really brilliant contention that the interests

of gas consumers and ratepayers are "absolutely irrecon-" cilable." It is as well that Parliament should be placed in possession of this fruit of Manchester experience, as, if it is regarded as seriously at Westminster as appears to be the case in Manchester, there is an end to the transfer of gas undertakings to local authorities. Nobody can contend that the interest of gas companies is not bound up with that of their customers; but if it is true—and Manchester ought to know—that the ratepayers, as a whole, are the natural enemies of gas consumers, then it cannot be expedient for the latter to be handed over to the tender mercies of the former. Unhappily, Alderman Gibson's position is not clear. He has denied being a gas-at-cost-price man, and has, on the contrary, declared himself in favour of the plausible gloss that, the gas undertaking being the property of the ratepayers, they have a right to substantial recompense for their responsibility. He remained contentedly in the camp of the subsidizers, till the time arrived when, owing to the dearness of coal, it became a question of raising the price of gas or foregoing the subsidy. That opened his eyes; and he saw the injustice of this indirect municipal taxation. But his attempt to sit on the two stools has had the usual result. A mere difference of 3d. per 1000 cubic feet in the price of gas does not make right into wrong. There is no logical halting-place between the position of a Councillor Plummer and that of the advocate of gas at cost price. This conclusion does not apply merely to gas. It should be the antecedent assumption upon which the argument for the expediency of municipalizing all suitable public services could safely rest. There is no other. Are water supply, electric lighting, the tramways, the markets, put into the hands of local authorities to make money by? Not at all. It is in order that the general public shall be well and cheaply served. Everybody pays rates, and expects to pay rates, wherever he goes. It is not every town that has cheap and good public services of all kinds.

Councillor Plummer thought he had clinched his argument when he showed that the "profit" on the last municipal year's working of the Manchester gas undertaking was "about 6¼ "per cent. Did anyone think 6¼ per cent. too much?" He asked the question with an obvious air of triumph. It is a pity that nobody answered him. In Glasgow they do not think it right to charge so much to the consumers for the use of the ratepayers' name on their bills. Take another illustration. Corporation gas capital is, of course, on an actual cash basis, like that of the two London Gas Companies who have consolidated and converted their ordinary stock to a 4 per cent. standard. But supposing all three London Gas Companies to have done this, and, further, that the average value of the stocks was par, and the dividend 4½ per cent. Where would be the advantage of municipalization, if the average capital charge were raised to 6¼ per cent?

These things are not settled by argument. Alderman Richards really put the extinguisher upon the resolution by remarking that the time was not propitious for raising the question. The Manchester Corporation want all the money they can get, by any means; and if the gas consumer has to suffer, he is not the only victim. Let him be thankful that he gets gas which does not actually poison him out of hand, and does not often fall below 15-candle power. Somebody calling himself "Semper Vigilans," we notice, has been writing to the local newspapers glorifying the Manchester Gas Committee at the expense of the neighbouring Liverpool Gas Company. Anything can be proved, if one is content to assume the correctness of corporation photometry, and knows nothing of sulphur purification. To those who understand the rights of these matters, the attempt to place Manchester gas on an equality with the Liverpool article is too ludicrous for serious refutation. It is gratifying to observe that the "Manchester Guardian" has a grip of the truths underlying Alderman Gibson's protest, and does not approve of the contemptuous way that the City Council dismissed his resolution. The worthy Alderman should not despair. He has merely to pluck up courage enough to go to the other side of the stream, instead of standing in the middle of arguments, and he will possibly win more support. There must be more than seven wise men in the City Council who could be brought to see the injustice and folly of making the Gas Department the milch-cow of the Corporation.

Affairs of the Newcastle and Gateshead Gas Company.

THE official narration of the actual circumstances of the Newcastle and Gateshead Gas Company, reported elsewhere, is well worth reading as an indication of how well a Company of this kind can serve a district. It is unnecessary to paraphraze the lucid and convincing observations of the Chairman (Sir W. H. Stephenson); and we therefore merely refer our readers to the text. Not many students of British gas making, otherwise familiar with the comparative size of the largest undertakings, would name the Newcastle and Gateshead Company offhand as fourth in regard to bulk of output for the United Kingdom. This result is largely due to the circumstance of the Company being in possession of the whole of their natural district, on both sides of the river; whereas in so many other localities mere topographical delimitations have barred the natural expansion of gas undertakings. In the experience of Newcastle and Gateshead, the unity of the gas supply has been abundantly justified. There was a heavy increase in the consumption for the past year; and the excellent present management is quite competent to realize the fullest benefit for the undertaking as a whole from this fortunate condition of the Company's business. The theory of Commercial Municipalism has a hard nut to crack in Newcastle. Here both the gas and the electric light are supplied by private enterprise, about as cheaply as anywhere in the country; and the local public appear to know when they are well off. The continued commercial prosperity of the Tyneside is wonderful. Whatever happens in the worlds of industry and commerce does not seem to touch the wealth-producing capabilities of this astonishing district. The Newcastle and Gateshead Gas Company stand second to none in respect to the thoroughness of their manufacturing equipment, and the excellence of their working; and they have their reward in an assured prosperity and a rapidly increasing business. The Company have but recently gone into the automatic prepayment meter branch of gas supply; and it should be interesting to mark how it will prosper in their particular connection. It might be imagined that gas lighting was already popular in this centre of the gas coal trade of the country.

The Midland Association Meeting—The Training of a Gas Engineer.

THE realization of an anticipated pleasure is a delightful thing; and so felt the members of the Midland Association at the close of their meeting last Thursday—the promise of good technical and enlivening fare having been fulfilled. The formal business was scant; and happily but little time was spent over it. The meeting was divided into two parts; and yet it will be seen there was a conjunctiveness about them which was not intentional. First came the presidential deliverance of Mr. Thomas Glover, of West Bromwich; and, secondly, a thoughtful and stimulating essay on the subject of "The Education of the Gas Engineer," by Mr. Thomas Berridge, of Leamington. Mr. Glover is an ornament to the younger generation of gas engineers and managers; and the occasion permits us to say, without laying ourselves open to the charge of partiality, that in him (as in several others we could name) is a specimen of the order of gas engineer that Mr. Berridge is desirous of producing, by the course of training he advocates, to officer the engineering quarters of the gas industry in the future. The matter of Mr. Glover's address, and the character of his previous communications to the gas profession, both written and oral, reveal the studious, inquiring investigator, who, in addition to original work, possesses the happy faculty of applying his trained mind to the testing of the truth and worth of new ideas and systems appertaining to his profession. He is, in short, an example of the engineer who has, as Mr. Hunt would put it, the power of assimilating knowledge and of applying it to the useful purpose of penetrating farther into its subterranean passages. Knowing well his old chiefs, we venture to say, without consulting our subject, that much of this is due to the personal assistance and encouragement of a willing student on the part of those set above him in the early days of his training and work.

We cannot follow the President through his admirable address, in which he deals with a dozen and more topics, upon each of which he furnishes suggestion and information which should not be allowed to stagnate. Coming from a district within the area proposed to be worked by the Mond gas people, his views (being the first public expression of a gas engineer on the subject) will be perused with more than ordinary interest. His remarks on water gas and benzol enrichment, the high-grade results he has secured in the case of coal gas manufacture, his researches into the naphthalene difficulty, his suggestion for reform in the methods of

purification, and the development of the gas industry in the direction of carbonization in bulk are points, among several others, which are treated invitingly, and which declare the expanse of the writer's study and thought and keenness of introspection. We particularly welcome Mr. Glover's advocacy of a proper recognition, and provision for the establishment, of gas cookers and heaters in the planning of dwelling-houses.

In the final paragraph of the address we find with gratification some sensible remarks upon a question which was recently raised in these columns, and which we regarded, and still regard, as of serious importance in connection with the future of the gas profession. Were justification required for what has appeared in these pages on the subject, there would be no necessity to go for it outside last Thursday's meeting, when forty or fifty gas engineers of the Midlands considered the matter of the education of our future gas engineers of sufficient moment to devote something like two hours to its grave consideration and discussion. This is a topic which the "JOURNAL" has ever, and particularly of late, kept in the foreground; and a repetition of our views is at the present time quite unnecessary. In his paper, Mr. Berridge reveals himself in a new light. He has shown himself to be, if he will forgive us for saying so, a better writer than extemporaneous debater; and Mr. Meiklejohn, as Secretary of the Association, is not likely to forget this. The paper is one not only of literary merit, but it is fruittul of points upon which much could and should be said. For instance, we do not penetrate beyond the first paragraph before we find Mr. Berridge supplying one very good ground for fear as to the future of the gas profession, unless some radical change is speedily made. "As to the training in the "works themselves," he says, "much remains to be done. "In too many cases pupils are *allowed* to learn—if they can. "They have the run of the works; but as to any systematic "course which they are compelled and assisted to follow, "this is, I venture to believe, *the exception rather than the rule*." If this is true—and Mr. Berridge certainly ought to know—who will be responsible for the under-supply of professional proficients for the gas industry of the future? We need not give a direct answer to the question. But if the status of the profession is to be maintained, and if the gas industry is to make that advancement in the future which is necessary to keep it in the fore as the source of the cheapest of artificial illuminants, then the engineers of to-day who undertake the work of training their successors must see to it that there is no failure in the performance of their duty. Mr. Berridge's argument is for specialized study in technical schools, and systematic training in the workshops and on the gas-works; and only upon the details of his case perhaps could any real criticism be founded. Regarded generally, it might be accepted as the base for future argument and action; and as such Mr. Berridge presents it. He does not by any means bind himself to all his suggestions; he simply puts them forward in the hope that out of them some good may arise.

The discussion was somewhat disappointing. Some of the speakers roamed at random between almost the *alpha* of education and the *omega* of present knowledge; and observation on the question of special technical education and training was decidedly deficient. With much that was said as to the education of a youth antecedent to his pupilage state in the profession, it is possible to agree; but, however much gas engineers may talk, we are afraid they will not influence a youth's studies (save in the cases of their own sons) during a single day prior to the signatures being appended to his articles. That is a matter which from force of circumstances must be left to the parents. For the present, a great and sufficient advance will have been made, if the profession can, by united effort, bring about an improvement in the opportunities for a thorough specialized education in the technical schools, and a systematic and properly supervised training on the gas-works. In regard to the latter point, there was a distinct flavour about the discussion of the alleged clerical injunction: "Do not do as I do, but do as I tell you." Advice and opinions were freely tendered by several speakers; but it would have been more useful—particularly in view of the already quoted remark from the paper—if they had supplemented their statements by an account of the actual systems they adopt in ensuring the thorough training of their own pupils and in testing their proficiency. However, we will not pursue the subject now, but fervently hope that out of Mr. Berridge's paper good will speedily come; for it is a subject that lies very near our heart.

London Chamber of Commerce against Gas Companies.

LAST week we published the reply of Mr. Kenric B. Murray, the Secretary of the London Chamber of Commerce, to the strictures passed by Mr. George Livesey on the action of the Chamber in offering their co-operation with Tramway and Light Railway Companies in opposition to Gas and Water Companies seeking protection for their mains from electrolysis. Mr. Livesey undoubtedly felt, and expressed, annoyance that the Chamber of Commerce, who enjoy the support of the South Metropolitan Gas Company, should have gone behind their back and proffered assistance to the opposition. It can hardly be sustained that Mr. Murray's explanation clears the Chamber from the most serious part of Mr. Livesey's complaint. To the charge of surreptitious action, it is a fair defence that the action was of a sectional character. Nobody expects the particular affairs of a section of a Chamber of Commerce to be communicated to all the subscribers. But the present case is not quite of this category. Here it was a question of a particular section setting the machinery of the whole organization against other commercial interests not unrepresented in the same body, and with equal rights in it. Not only so, the Secretary, upon being moved thereto, not merely joined in the opposition to the contemplated action of the Associated Gas and Water Companies, but seems to justify his action in his letter to the "JOURNAL" on the score that "an attack "is now being made upon the electrical industry by the "Gas and Water Companies." The sole evidence brought forward in support of this remarkable allegation is that the Gas and Water Companies desire protection against all loss or damage to their pipes due to electrolysis. He calls this an "attack"! And all because the miserable gas and water people will not rest content for evermore with what was done for their protection in 1893! Things have changed somewhat since then; and the Gas and Water Companies have moved with the times. If their natural objection to be injured without effectual redress by the trading operations of other people is to forfeit the support of Chambers of Commerce, they had better do without these organizations altogether. The clause denounced by Mr. Murray in regard to the Wrexham Tramways does no more than place all the onus for avoiding electrolytic damage upon the interest that profits by the use of electricity in working the tramway, which, to most impartial persons, will appear a perfectly reasonable condition. Electricians may think otherwise; but that does not much matter, so long as they are not held to be competent judges in their own cause, as Mr. Murray evidently thinks they are when the other party is a Gas or a Water Company.

The Money and Coal Markets.

THE reduction (by two stages) of the Bank-Rate from 5 to 4 per cent. is due to a variety of causes. One was the abnormally heavy payments made during the past fortnight on dutiable goods taken out of bond, in anticipation of the increases in the various duties which the Chancellor of the Exchequer may find himself obliged to impose. Another contributory cause, though not yet perhaps of great effect, is the slackening of trade all over the country. The recently prevailing high prices in the iron and allied industries has undoubtedly exercised a considerable restricting influence upon the flotation of new industrial enterprises—the dearness of money itself having also acted in the same direction. The call for capital has, therefore, not been so great. As an actual instance of the restrictive tendency of dear money upon capital issues may be mentioned the fact that the Directors of the London General Omnibus Company state, in their report, that they have decided to borrow £100,000 from their reserve fund to expend for capital purposes, rather than issue fresh stock at the present moment. When money is easier, they will restore the reserve fund to its former figure.

Moreover, the falling off in the volume of business being done in this country—involving reductions in the amount of money circulating among traders and also among the working classes—is thereby having its effect upon the Money Market. Be the causes what they may, the lowering of the Bank-Rate is decidedly welcome to the gas industry, and to no undertaking therein more than to the largest. The Gaslight Company's dividend-paying day is the 1st prox., and, as the Governor told the half-yearly meeting the other day, the Company will be indebted to their bankers for the cash wherewith to pay the proprietors. As the total amount of cash needed for the purpose is something over £400,000, and the Company appear to pay bank-rate for their loans, a

reduction of 1 per cent. in the rate of interest means to the Company a saving (so long as the amount stands at their debit with their bankers) to the extent of £4000 a year.

This easing of the Money Market is, as we have said, undoubtedly in some measure a reflection of an easier condition in others—notably the iron and steel markets. The break-up of coal prices can as yet have had no effect upon the Money Market, as it is in the future rather than in the present that the benefit of the lower rates for coal will be felt. Iron prices continue to weaken; but no further reduction was recorded in the Coal Market last week. Indeed. the colliery proprietors are trying to persuade themselves that the worst is over, and that prices will not go lower. There is absolutely no reason, so far as existing and probable future conditions are concerned, why they should not. It lies, as we have so often pointed out, very much in the hands of the coal buyers at the present time to decide whether or not prices shall come down further. To hurry on to the market is to fix the level for the year's supplies at the present rate of, say, 9s. 6d. to 10s. per ton f.o.b. Tyne. Some companies appear to be content that it should be so, and are buying forward at current rates. The spring seems to us quite soon enough to think about contract making, and not then if the collieries be not in a reasonable frame of mind. There will be plenty of coal to be had this summer; for although labour clouds are visible in the sky, there is no immediate cause to fear a storm. The miners in Scotland are expected to accept (under protest, but without a fight) the reduction of 1s. per day upon which the owners have determined to insist. There, as in the other districts, the struggle will come when it is proposed to revert more nearly to the rates in force before the "boom" began.

Institution of Junior Engineers.—At the meeting of the Institution next Friday, Mr. Samuel Cutler, jun., will read a paper on "Carburetted Water Gas." In connection therewith, a visit will be paid on the 9th prox. to the Southall Station of the Brentford Gas Company, where, by permission of Mr. James Husband, the Engineer and Manager, the members will have an opportunity of inspecting not only the carburetted water-gas plant installed there, but also the system of carbonizing with inclined retorts, the coal and coke elevating and conveying machinery, and the sulphate-making plant. The visit will be an instructive *addendum* to the paper.

Manchester District Institution of Gas Engineers.—The thirty-first annual meeting of the Institution will be held at the Mosley Hotel, Manchester, on Saturday. We learn from the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich) that two new members will be proposed; and after the reception of the report and accounts, the Senior Vice-President and other office-bearers will be elected. Mr. Ritson, the retiring President, will then vacate the chair in favour of his successor, Mr. Charles Wood, F.C.S., of Bradford, who will deliver his Inaugural Address. Mr. Richard Hooton, of Ashton-under-Lyne, will afterwards introduce the subject of the enrichment of coal gas, which should lead to an instructive discussion.

A Lavoisier Medal.—The "Chemist and Druggist" states that M. Berthelot, one of the Permanent Secretaries of the Paris Academy of Sciences, is taking steps to carry out a resolution of that body to distribute annually a gold medal in memory of Lavoisier. M. Paulin Tasset, the engraver, is preparing the die of the medal, and has taken as a model a medallion of the great Chemist (in profile) by David d'Angers. The inscription will be of the simplest nature. The name "Laurent Lavoisier" will appear under the profile, and on the back of the medal the words "Institut de France, Académie des Sciences, Médaille Lavoisier." The medal is likely to become greatly prized by chemists, and will be given for distinguished chemical research. It will be awarded for the first time this year by the Academy; and its annual distribution is assured by a balance remaining over from the subscription for the monument, which was unveiled last summer behind the Madeleine Church, Paris.

Amalgamation of Messrs. George Glover and Co. and Messrs. Richmond and Co.—With reference to the paragraph which appeared in the "JOURNAL" last week (p. 454) on the subject of the conversion of Messrs. George Glover and Co., of Chelsea, into a limited liability company, we learn from the report which will be presented at the annual meeting of Messrs. Richmond and Co., Limited, next Thursday that arrangements have been completed, subject to the sanction of the shareholders, for an amalgamation of the two Companies. Messrs. Glover's business was established in 1860; and it has made steady progress. It will be carried on under the old name, and remain under the management of Messrs. George and William Glover (Mr. Thomson Glover's services being retained as Consulting Engineer); but the first-named gentleman will join the Board of Messrs. Richmond and Co., and accept the position of Vice-Chairman. It is proposed to change the title of the Company to "The Richmond Gas Stove and Meter Company, Limited." The Directors anticipate very satisfactory results from this alliance.

WATER AFFAIRS.

The Proposed New Water Regulations.

WE question very much whether, in the history of the Metropolitan Water Supply, any action on the part of the London Water Companies has met with so much hostile criticism, on the platform and in the Press, as their application to the Local Government Board for the sanction of the Department to a revised set of regulations governing the supply of water in the houses of the consumers. Dictionaries seem to have been searched for the most opprobrious epithets to hurl at the authors of the new regulations; friends and foes alike joining in the chorus of denunciation of the Companies. It was to be expected, from the result of the conference of representatives of Borough Councils which took place at Spring Gardens on the 4th inst., that the proposals of the Companies would encounter strong opposition; and any shadowy doubt remaining on the point was dispelled at the meeting of the County Council the next day, when the regulation requiring the provision of a cold-water cistern in every house or flat was opposed by practically the entire body of members. Since the opening of the Local Government Board inquiry a week later, the Companies have been the objects of invective such as only they and the Gas Companies appear to be able to evoke. This was to be expected from newspapers of a certain class; but when the "Financial News" pronounced on Friday a diatribe in comparison with which the other journalistic utterances—strong as they certainly were—were mildness itself, one could not help comparing it with the final stab inflicted upon the imperious Roman by his *quondam* friend. The Companies are characterized as "demented;" their regulations, as "a clumsy scheme for enhancing, at the "expense of the consumers, the value of the water property, "in view of the probable formation in the future of the London "Water Trust." It is remarked that the case of the anti-municipalists is that private is commonly more efficient than collectivist enterprise; but the opinion of our contemporary is that it must now be sorrowfully admitted that the Metropolitan Water Companies are an exception to the rule, and the conclusion is come to that "the Gaslight and Coke "Company itself has not produced greater incompetence." Hope is expressed that the "preposterous" regulations will not react upon the Moderate party at the forthcoming County Council election.

This is very strong language; and one may well ask: "Have the Companies deserved it?" Why were the revised regulations brought forward? Simply to comply, as we pointed out last week, with the suggestion thrown out by Lord Llandaff's Commission. The introduction and gradual extension of constant supply which followed the recommendation upon this subject of the Select Committee of 1867 revealed not only the weak points in the consumers' fittings, but also the fact that the regulations made in 1872 were inadequate in the changed conditions. This was brought home to the Companies twenty years ago; and, as time went on, it became more and more obvious that steps must be taken to check the waste resulting from inefficient fittings with the constant supply. But nearly fifteen years were allowed to elapse before any serious attempt was made to modify the old regulations; and for this dilatoriness the Companies were censured by the above-named Commission. They were told they had been "remiss in not proposing a "change." The New River Company took the initiative; and Mr. Collins, their Engineer, produced a schedule of fittings by the use of which—and only in this way—the Company have been able to maintain the constant supply in their district. It was naturally thought that fittings which were suitable for one district would be applicable to the others; and accordingly they were made the basis of the new regulations.

With regard to the much-condemned proposal to reintroduce cisterns, if there was one thing more clearly expressed than another in the report of the Llandaff Commission it was this—that suppliers of water, whoever they might be, should have power to require that a properly constructed cistern, approved by them, should be placed in every house supplied with water, whether the service were constant or intermittent. Such power, as the Commissioners recognized, the Companies do not possess; and, in view of the unequivocal language of the report, they are asking for it. Further justification for their action will be found in the report of the Commissioners appointed by the Local Government Board to

inquire into the failure of the water supply through frost and drought in 1895. In that report, stress is laid on the distinct advantage of having properly designed means—not the old defective cisterns—for the storage of water in houses. However much clamour may be raised against cisterns, people will have receptacles for water, even if, as Mr. Collins stated at the inquiry last Wednesday, they are nothing better than paraffin tubs into which the water runs at the rate of 50 gallons an hour. Another subject on which there has been a good deal of talk, is the quantity of water necessary for flushing closets. We are rather surprised that this question should have been reopened after the decision come to by the Local Government Board, following the inquiry in 1895, not to alter the two-gallon to a three-gallon flush. Even the London County Council do not intend to contest this matter any further; and the Companies will certainly resist any increase, as they have proved that the smaller quantity is quite as effective as the larger, and, moreover, does not encourage waste.

In framing the new regulations, the officials of the Water Companies endeavoured to make them as comprehensive and efficient as possible; and we think they are to be commended, not abused, for so doing. They were put forward as embodying, from the results of experience, what is required to meet the views of the last Royal Commission and to safeguard the supply; and they were fully explained at the inquiry by Mr. Collins, whose searching cross-examination by seventeen representatives of Local Authorities, to say nothing of the outside criticism of the Press, was an ordeal which few witnesses would have cared to pass through. It had, at all events, one good result—it brought out a number of suggestions which are worth consideration on their merits. Quite at the outset of the inquiry, the Companies manifested a willingness to meet their opponents' views as far as possible by amending the regulations in several important particulars, notably in the reduction of the capacity of the cisterns from 25 to 20 gallons; and at the close of the re-examination of Mr. Collins last Wednesday, a proposal was made that the proceedings be suspended for a few days, to allow time for a consultation of the Companies' Engineers with the view of possible further revision. The inquiry was accordingly adjourned till next Thursday. If concessions on both sides should lead to the production of a set of regulations more generally acceptable than those originally framed, a very definite step will have been taken in the direction of shortening an inquiry which early last week promised to rival in length the last Royal Commission. It has been pointed out more than once that, no matter who has charge of the water supply, efficient regulations are necessary; and therefore it will be well for the London County Council and the bodies associated with them to refrain from carping criticism of rules which are probably much less stringent than those which they would themselves enforce were they in the position occupied by the Water Companies.

The County Council and the Water Question.

On Saturday the ratepayers of London will be asked to elect their representatives on the new County Council; and by the time the next issue of the "Journal" appears, we shall know whether that body will be mainly Conservative (for what has been called the "insipid designation" of Moderate has been dropped in favour of the more expressive title) or Progressive—the latter being understood to be synonymous with Liberal or Radical. In the addresses and speeches of the respective candidates, the Water Question has necessarily figured conspicuously; and the unfortunate occurrence of the Local Government Board inquiry as to the new regulations proposed by the Water Companies has not only furnished the Progressives with an additional subject on which to attack them, but has also brought the Conservatives into hostility. The forthcoming election, like that of 1898, will be fought on the Water Question. The Progressives are still bent upon possessing the water undertakings; and they will fight for them notwithstanding the promised action of the Government next year. In so doing, they will only be following up their policy of the last twenty years, which has obstructed every legitimate attempt to place the undertakings in the hands of a properly constituted public body. This fact was emphasized by Lord George Hamilton at the meeting of the Joint Committee of the London Municipal Society and the Metropolitan division of the National Union of Conservative Associations last Friday. He pointed out that if the proposals made by Lord Beaconsfield's Government twenty years ago had not been rejected, the acquisition of the water undertakings on behalf of the ratepayers would have been effected, and millions of money saved; and he added that, notwithstanding the rejection of that scheme, purchase would have taken place if the Progressive majority of the County Council had been in a reasonable frame of mind when the proposals made on behalf of that body were brought forward. It was not "sweet reasonableness" but sheer "wrong-headedness," as Mr. Mansergh has called it, which they displayed; and they are persisting in it by wasting the ratepayers' money in promoting their Water Bills in face of the statement of the President of the Local Government Board that he will advise their rejection. This may be justified on the ground of being a "consistent continuation of the Council's "policy on the Water Question." But that policy has already cost the ratepayers £60,000; and what is there to show for it? We will let Lord Farquhar answer the question. His Lordship, in his address to the electors of West Marylebone, says: "This expenditure has not only been "fruitless, but the policy of the Radicals has placed further "obstacles in the way of the settlement of this all-important "question." With this we leave the Progressives.

As far as the Conservative party are concerned, they will, of course, support the Government scheme of a Water Trust; but, on the other hand, they will to a man resist the proposed new regulations. Mr. Harris announced this in the most unmistakable language at the meeting above referred to. It is, however, with the larger question that we are now more immediately concerned; and therefore we may express the hope that the result of the election may not be a Progressive majority. For if, as Mr. Harris was careful to point out, a Radical majority is returned to the Council, the conflict with the Government on the Water Question will continue, and its settlement be delayed; whereas if the Conservatives obtain a majority, it may be presumed that the Council's Bills will be dropped, and then the way will be clear for the measure which the President of the Local Government Board has promised to introduce. The hope we have ventured to express is based upon a conviction that a change in the balance of parties on the Council would not be greatly to the detriment of the ratepayers. As "The Times" pointed out on Saturday, "Progressive" is a word which, like "Liberal," conveniently begs a great number of very inconvenient questions, and "serves as a "cloak for much that is illiberal in thought and obstructive "in action." The present Council's failures—and they have been by no means few—have resulted from the fact that progressiveness is "largely an affair of show for party "purposes," and that "the real needs of the population are "subordinated to the pushing of political fads." Our contemporary thinks that, for several reasons, there is much room for a change of policy—for "more sincere and en-"lightened regard to the real interests and needs of the "community, and for less of reckless experimenting upon "questions which become dangerous in the hands of par-"tisans." It will be for the electors to show next Saturday whether or not they agree with the opinions here expressed. If they do, their course will be clear.

Electrical Waves and Light Rays.—In the last of his Cantor Lectures before the Society of Arts, on Electrical Oscillations and Electric Waves, Dr. J. A. Fleming discussed several questions connected with wave production in general. One physical characteristic of wave motion is that by it energy is conveyed entirely away from the wave-creating body and exists for a time stored up in a surrounding medium. It is this consideration that adds complexity to our conception of the cosmic æther. Energy actually passes away from one body, is stored up for a time in the contiguous medium, and ultimately reappears in another body. Dr. Fleming described the different elements of wave motion, regarded as a mode of transferring energy from place to place. He remarked that waves can exist in any medium which possesses two essential qualities. The first of these qualities is that some kind of vector or directed change made in it must tend to disappear if left to itself; and not only so, but in being created it must call forth opposition or resistance to its creation. In the second place, in disappearing, the change, whatever its nature, must tend to overshoot the mark and be reproduced in the opposite direction. In other words, there must be a persistence or inertia-like quality in connection with the change of deformation. Speaking of the work of Professor A. Rhigi and others on electrical waves, Dr. Fleming said that the wave lengths have been so reduced of late, that an electrical radiation has been obtained of only fifty to sixty times the amplitude of the longest heat waves which have been sifted out by repeated reflection from a Welsbach gas-burner.

ESSAYS AND REVIEWS.

THE OBSTRUCTIVE TENDENCY OF OFFICIALISM.

To those who hold that the way of reform and progress lies in the direction of communism and municipalism—the taking over by the State or the Municipality of the principal industries of the country—we would commend the perusal of an article by Professor J. A. Fleming, in the February number of "The Nineteenth Century and After," on "Official Obstruction of Electric Progress." It is as effective an indictment of officialism as we have seen for some time. Professor Fleming traces the history of applied electricity from the year 1870, when Gramme effected his improvement of the dynamo—whereby a perfectly uniform steady electric current was made possible—down to the present day. The recapitulation touches upon the discovery at Vienna, in 1873, of the use of the dynamo as a motor; the invention in America five years later of the Brush arc lamp; Edison and Swan's production of the filament incandescent lamp (1879-80); and Faure's improvement of the electric storage battery (1881)—a series resulting in the birth of domestic electric lighting which may be said to have taken place at the Crystal Palace Electric Exhibition of 1882.

Subsequent to that date are noted, Gaulard's proposal—carried out by the joint efforts of Zipernowsky, Blathy, and Ferranti—to employ high-pressure alternating currents for the purpose of distribution over wide areas, and the later adoption of polyphase alternating currents, due to the research of Ferraris, Tesla, Dolivo-Dobrowolsky, and C. E. L. Brown. As to this method of distributing electrical energy, Professor Fleming remarks that it "has advantages of a very special kind in the transmission of power; but, while in America and Switzerland much has been done with it, we in England have only as yet laid feeble hands upon this tool." Prior to this, the telephone had been brought into use, as a result of the work of Bell, Edison, and Gray in America, and Hughes in England.

The development of electric traction in the United States began in 1885. In telegraphy, high-speed transmission has been rendered possible by the inventions of Gray, of Chicago, and of Foster Ritchie, and by the introduction of the Pollak-Verág system. To Marconi we owe wireless telegraphy by means of electric waves.

In reading Professor Fleming's *résumé* of the past thirty years' progress in the applications of electricity, what is most noticeable is the preponderance of foreign names in the list of workers in the practical field; and it is to that point that he is leading. "In reviewing the nationality of those who have thus helped to make the electric current the nimble servant of mankind, it is impossible," says Professor Fleming, "not to be struck with the fact that British names do not preponderate. In the region of pure scientific research, in the development of electrical theory, Great Britain has unquestionably held her own with the world. In detailed improvements or adaptations, we have not been backward. But if we except the inventions of Lord Kelvin in connection with submarine telegraphy, of Mr. Swan in electric lighting, and the contribution which the late Professor D. E. Hughes made to telephony by the invention of the microphone, it is difficult to name any first-rate new adaptation of electrical discovery for practically useful purposes in the last thirty years which has not come to us first from non-British sources. It cannot be said that the country which has produced a Watt, a Stephenson, and an Arkwright is deficient in mechanical inventiveness; but it is impossible to deny that the period of time since 1870 has not been marked by the evolution of distinctly novel electrical inventive ideas proceeding from British minds."

The question naturally arises, Why should this have been so? Professor Fleming's answer is that one of the prime causes of the evil lies in the creation, in 1870, by the Legislature, of "a gigantic Government monopoly in one large department of electrical invention [telegraphy], which has exercised a most undoubted control over the supply and demand for invention in a wide area of electrical work." This monopoly was subsequently held, by a somewhat doubtful judgment, to cover telephony; and the National Telephone Company have now to pay a 10 per cent. royalty on their gross receipts to the Post Office. It is pointed out as worthy of note that the business actually conducted by the State (the postal telegraphs) works at a loss; while that conducted by private enterprise (the telephone system) produces considerable profit.

The effect of this placing of the sole control of electric transmission of news in the hands of a State Department, was to put at the mercy of Government officials all inventors of improvements in telegraphic methods. And Government officials are notoriously not friends of innovation. If there is to be any invention at all, the official "generally likes it to proceed from himself, doubtless at the expense of the Nation, so that he may keep before the public eye," and earn the much coveted C.B. "A young man bursting with new ideas does not generally enter the Civil Service. . . . Hence we should hardly expect a State telegraph official to be a prolific and original inventor."

Patentees, however, like the rest of us, have to earn a living; and if all proposed improvements in telegraphy have to await the pleasure of lethargic and sometimes unfriendly officials before they can find opportunity of adoption, inventors will turn their attention to other fields of work. "The most effective method," says Professor Fleming, and few will be found to dispute his dictum, "of afflicting any department of applied science with creeping paralysis, is to constitute it a Government monopoly." The attitude of the Postal Telegraph Department towards wireless telegraphy, as conducted by Marconi, exemplifies this fact. "Two years ago, he signalled thirty miles across the Channel; a year and a half ago he flung his messages for sixty-five miles at the naval manœuvres, and ninety miles from Wimereux to Dovercourt. This year he has abandoned the use of high signalling masts, and solved the problem of perfectly isolating simultaneous messages from each other. The Postal Telegraph officials have just succeeded, by imitating his earlier methods, in effecting wireless communication between Ilfracombe and the Mumbles."

Other sources of the backwardness of electric progress in this country are indicated as existing in the Electric Lighting Act of 1882, which enabled Municipalities to lie down in the path, and which, by its short-term purchase clause, kept capital out of the field; in the Tramways Act of 1870, with a similar capital-scaring clause; and in the "obvious tendency of much recent legislation to encourage local authorities to supply those things which are common needs. Hence, municipal bodies have great power in deciding the speed at which progress in electric lighting and electric traction shall take place. In this, they make haste slowly." Hence, also, the opposition to schemes for the distribution of electric energy "in bulk."

It is pointed out that town councils supplying electric current have fiercely opposed these schemes for wholesale supply; municipal traders demanding a protection for their undertakings that would not be granted to private enterprise, which has to take all the risks of competition.

The legislation that prevented the free flow of capital towards electrical enterprises, thereby checked invention in this country. "If Necessity is proverbially the Mother of Invention, capital may with justice be called its Father." The evolution of ideas requires the hazarding of capital; and this will only be done by private, not municipal enterprise. Where would the gas industry be to-day had it been swathed from the first in municipal garments, or been placed, like telegraphy, under the control of a Government Department? By a merciful dispensation it has never, as a whole, become even a *quasi* department of State.

Professor Fleming's conclusion is that, "if electrical invention is not to languish in Great Britain, some reforms seem necessary. Public opinion must be brought to bear more strongly, through the Press and Parliament, upon the administration of Imperial and Local Governmental Departments which are in the practical control of electrical monopolies. The conduct of municipal bodies to new electrical enterprises must be continually criticized. A stronger public opinion must be created on the value and immense national importance of scientific research and invention. Professor Perry has recently emphasized this necessity in an eloquent address to the Institution of Electrical Engineers. All electrical inventions are based upon a scientific knowledge of the facts of Nature. One object of scientific research is to provide the necessary exact information which lies at the root of successful applications in the arts. The late Professor Huxley once declared that if a young Faraday could be purchased in the open market for the price of a first-class battleship, the purchase would be a bargain. For all we know, he may be had for nothing; but we must first make an environment suitable to foster inventive genius, and not permit it to be repressed by educational or legislative conditions."

These be wise words, and have an application outside the world of electrical invention. Does the environment suitable to foster inventive genius, or commercial initiative, or business enterprise, exist in the gas undertakings of this country as generally as it might do?

THE NEED FOR BETTER EDUCATION.*

THE problem of how so to educate the rising generation as to obtain the best possible material out of which to fashion men qualified to control most efficiently the commercial interests of this country, occupies an increasing place in the minds of the thoughtful among us. Its difficulty is admitted, and does not grow less as consideration becomes more earnest. Not a little of this difficulty lies in persuading many capable and weighty persons that the problem is a pressing one. They point to the numerous instances of men who, having had little or no education, have yet taken high rank in the industrial and commercial world—men "whose school has been the workshop, their university the world." Why, then, since we have done so uncommonly well in the past by trusting to native talent, inborn capacity, and mother-wit, should we be troubling ourselves about the future? Richard Arkwright, the barber; George Stephenson, the colliery fireman; and Robert, his son; Robert Owen, the son of a saddler—these men were self-educated, self-made. How are we going to improve on them by means of any system of education?

The answer is, that we have advanced so far along the road of

* In writing this article, the author had no knowledge of the contents of Mr. Berridge's paper on the same subject read at the Midland Gas Managers' Association meeting last Thursday; so that the article must not be regarded as in any way a comment on Mr. Berridge's proposals in the matter of the better education of aspirants to the gas engineering profession.—ED. J.G.L.

science since the days of Arkwright and the Stephensons, that before any man can take strides along that road ahead of his fellows, he has to acquaint himself with the vast accumulation of knowledge already acquired by his predecessors. He has also to learn, as the commonplaces of science, facts the discovery of which formed the lifework of antecedent geniuses. As Sir Henry Roscoe, writing in the "Monthly Review" on "The Outlook for British Trade," well puts it: "To advance science, whether pure or applied, in the early stages of scientific history was comparatively easy. To make discoveries of equal importance in the more advanced stages demands, not only a thorough knowledge of what has gone before, but especially a complete training in the methods by which these results have been obtained. To be a leader in new paths, the outfit must now be full; an inadequate provision rapidly brings the traveller to grief."

The men who are going to improve upon our machine-making methods, our steel-forging processes, our locomotive designs, our electricity-generating plant, our gas-making apparatus, need to start their careers much better equipped with mathematical knowledge, natural philosophy, and physical and chemical science, than did Arkwright or Stephenson or Murdoch. New planets are not so easily found nowadays as when Herschel discovered Uranus and the satellites of Saturn. They would certainly never be found by one who had, by dint of years of experiment and failure, to construct his own telescope.

Moreover, the would-be astronomer, engineer, or manufacturer, has not only to learn what his predecessors have to teach, but also to acquire the habits and methods essential to further research. Here our public school and university methods are almost entirely at fault. They turn out scholars—book-learned men—but not scientific investigators, or men trained to apply science to practical ends. And the scholars are honoured by the public more than are the scientists. The unfortunate result is, as Sir Henry Roscoe points out, that our Governments—afraid to act in advance of public opinion—hesitate to take the steps which other nations have long since deemed necessary, of founding and supporting "at least one complete and thoroughly organized High School of Science . . . to do for English industries what the *Federal Polytechnicum* at Zurich has done for Switzerland, and what the *Reichs-Anstalt* at Charlottenburg is doing for those of Germany."

Birmingham University is a step taken by private enterprise and munificence in the right direction. The University of London is now being remodelled. Will not the Government spend a few hundreds of thousands in establishing therein a School of Science, where the future leaders of our industrial army may be trained to the highest point of efficiency? It would be a wise and prudent expenditure, amply to be repaid in the future.

ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of the Victoria Embankment—The Verdict of the Coroner's Jury on the Liverpool Trolley-Wire Catastrophe—Municipal Electric Lighting "Enterprise."

It is so thoroughly understood by the Parisian populace that Paris is not only the capital of France, but really *is* France, that the accident of a cart being upset on the boulevards bulks more as news in the Paris journals than almost anything that can happen in the Provinces. London is not afflicted with the same complaint; but if some Londoners had their way, it would quickly become as ridiculously self-centred. For instance, all the fuss possible was made last week by some London newspapers, which should have known better, over the beginning of the electric lighting of the Victoria Embankment by the County Council. This magnificent enterprise has been about fifteen years in hand, as we remarked the other day; and its completion, after a fashion, has been hurried up at the last in order that the present majority of the Council may score it to their own credit as an accomplished fact by the time they go once more to their constituents. Meanwhile, the fashion of arc lighting is fast passing away. There are not so many arc lamps in use throughout the civilized world to-day as there were five or ten years ago. The London County Council in its Progressivism is like the old village dames who never take up with a mode in raiment until some years after everybody else has dropped it. There is a certain quaintness in this idea; but it is hardly the practice one would expect to find in favour with the chief Metropolitan Local Authority.

The Liverpool Coroner's inquiry into the lamentable trolley-wire casualty has ended in a finding which is thoroughly typical of the wisdom of the "man in the street," who may be taken for a representative common British juryman. Far be it from us to speak disrespectfully of the great Palladium of our liberties; and when it is an affair of something within his comprehension, the British juryman is one to whom a man on trial for his life may confidently look forward for a verdict fairly in accordance with the evidence, and certainly given without fear or favour. But it is hard on the common juryman to expect him to judge between electric wires, as he might between man and man. Consequently, seeing the way in which the issue was put to the Liverpool Jury, it is not wonderful that they should return a unanimous verdict that "death was caused from shock consequent upon becoming entangled in telephone wires owing to these wires breaking and coming in contact with the tramway trolley wires," to which they added the rider that, "while of opinion the occurrence was due to accidental causes, they considered the accident might not have happened if the telephone standards had not been so far apart." Your average coroner's juryman loves his little "rider," and will have it whensoever the matter is a bit mixed in his mind and nobody objects to his relieving his conscience in this fashion. In this case, the Liverpool Corporation did not care how deeply the Jury reflected upon the law of gravitation, or any other awkward detail, so long as they stood absolved from blame. We do not go so far as to impute specific blame to the Corporation, or the Board of Trade, or anybody else for what was a deplorable combination of potentialities, suddenly realized by influences beyond human control. Only, the accident was one that ought never to have happened; and but for the ignorant clamour for the electrification of street tramways anyhow, it never would have occurred. If any British municipality, with the consent of the Board of Trade, permits the same conditions to be repeated somebody ought to hang for the roasting alive of the next victim.

Are not people growing weary of reading journalistic puffs of the "enterprise" of local authorities in venturing upon electric lighting and similar unnecessary burdens upon the public credit? Here is the "Daily Telegraph" of the 21st inst., hailing the opening of the Fulham Corporation Electricity Supply Undertaking as an occasion of "something more than local interest, since it marks the final triumph of yet one more London Municipality in a field of enterprise which has in not a few instances been surrendered to private corporations without serious protest." And very properly, too. We all know that spirit of municipal "enterprise." It usually goes with sloppy streets, neglected slums, forgotten dust-bins, and miserly public lighting off the main roads. It is also maintained by heavy drafts on the rates, either directly in support of the electric lighting undertaking, or indirectly in payment of extravagant bills for the electric lighting of certain streets, the public offices, the libraries, the workhouse, and so forth. Of course, the "Daily Telegraph" does not know this. Newspaper reports of these topics appear to be written by gentlemen (or ladies) who do not pay rates, and have not the most infantile notions of the business side of public affairs. So, on the present occasion, the readers of the newspaper with the "largest circulation in the world," are told, as news, that the St. Pancras Vestry has the credit of being the first Local Authority to establish electricity supply works in London. And a good deal of "credit," in another sense, this move has entailed. Next is repeated the fairy tale of Shoreditch, which was among the first to try the combination of dust destruction and electricity production. Fulham, it is stated, has "gone one better than Shoreditch," in actually combining "dust destruction and electricity supply with a building for public disinfecting purposes." Here's a paying combination! It is only fair to the "Daily Telegraph" reporter to own that he does ask himself if these Metropolitan parochial speculations in electricity supply "with trimmings," pay. Characteristically, he is satisfied with very slight evidence on this head. He remarks that "a profit is *shown* in the case of each of the five London Municipalities whose last available accounts for a period of twelve months' working are examined." The italics are not his. When he wants further assurance on the point, he naturally does not go to an independent authority, but to the virtuous specialists in the trade of supplying aspiring local authorities with electric lighting establishments. He tells his readers that "some useful calculations as to the relative ability of municipalities and of private companies respectively to serve the public advantageously, have recently been made by Mr. G. W. Spencer Hawes, Chief Assistant to Mr. Robert Hammond, the Consulting Electrical Engineer, to the Hackney Borough Council." Why not refer to Lord Avebury?

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 563.)

The general course of business in the Stock Exchange last week was much on a par with the run of things in the preceding week. The pronounced revival of activity still remains among those things which have to be looked forward to; but the prevailing tone was fairly steady. Some irregularity was noticeable here and there, even in kindred issues, which usually march together, and some of the more speculative departments were decidedly flat. But on the whole the week did not close badly. In the Money Market, the feature was the reduction of the Bank of England rate on Thursday to 4 per cent. from the 4½ per cent. rate to which it had been lowered a fortnight previously. The extreme ease in the earlier part of the week had pointed to this reduction as a certainty; but before it was actually made, money had already begun to harden a bit. Business in the Gas Market was very irregular. For the first three days, it was almost phenomenally quiet, after which there was quite an outburst of dealings, especially in the leading issue. The general tone was bright and buoyant; a large number of quotations were revised, and all of them in the upward direction, with the single exception referred to below. In Gaslights, the ordinary dozed through the first half of the week, and then woke up into great activity. The figures at which transactions were marked were extremely steady, never ranging much above or below 97. The secured issues were little dealt in; but the preference was able to rise a point. South Metropolitan was only moderately dealt in. The reduction of the quotation by a

couple of points was only a natural and proper adjustment to the reduced rate of dividend. It cannot be said that the stock was flat; for it still remains the choicest in the market. Commercials were quite unnoticed. Very little business was marked in the Suburban and Provincial group; but they were full of rise. Brentfords, Brightons, and Tottenham show a more or less considerable advance. The Continental Companies were on the whole very quiet; but Imperial grew brisker towards the close, and had a smart rise. Among the remoter undertakings, there were advances in Ottoman, Buenos Ayres, and River Plate. The Water Companies were not in good favour generally; and several issues underwent a slight decline.

The daily operations were: Business in Gas was dead-quiet on Monday; but Brentford old rose 1, ditto new 2, and Buenos Ayres debenture 2. South Metropolitan fell 1. Tuesday was equally quiet. South Metropolitan fell 1; but Brighton ordinary rose 5 and Gaslight preference 1. In Water, East London debenture fell 2. Wednesday was another slack day. Both Brightons advanced 2½. Activity began on Thursday, coupled with continued firmness. Imperial rose 3. In Water, Chelsea rose 1. Friday was very brisk. Brentford and Tottenham debentures rose 1 each. Saturday was quiet, but strong. Brentford new gained 1, and Ottoman and River Plate ¼ each. In Water, Lambeth fell 3, Southwark 2, and Grand Junction ½.

MISCELLANEOUS CORPORATION, &c., BILLS FOR 1901.

A NUMBER of Bills are being promoted this year by British Municipal Corporations, Electric Light and Power Companies, &c., which contain proposals incidentally affecting gas and water undertakings.

The Blackburn Corporation Bill contains a clause empowering the Corporation to alter the position of any gas or water service pipes, so as the same be done with as little delay and inconvenience to the inhabitants as the circumstances of the case will admit. The provisions of section 308 of the Public Health Act, 1875, are to apply to this section. There is also a clause empowering the Corporation to see to the ventilation of rooms intended for human occupation. Bye-laws are to be made for the regulation of water-closet provision. It is proposed to use some of the Corporation gas lands for the generation of electricity. Powers are sought for the supply of electricity to local authorities, owners, and occupiers within the borough gas and water limits, and also in the district of Rishton. There are to be restrictions on the fixing of overhead electric wires. The additional sum of £10,000 is to be raised for electrical purposes, repayable in twenty years.

The Burton-upon-Trent Corporation Bill is to obtain powers to construct numerous public works within the borough, including the alteration of the position of any water or gas pipes, subject to the obligation to cause as little detriment and inconvenience as possible, and to make reasonable compensation for any damage done. The height of factory (including gas-works) chimneys is to be prescribed. It is desired to borrow money for the construction of a tramways electrical power station; to issue Corporation Bills as a means of borrowing money; and to use stock redemption funds instead of exercising fresh borrowing powers.

The East Middlesex Electricity (District Councils) Bill is to constitute and incorporate a Joint Board, representing the District Councils of Edmonton, Enfield, Southgate, Tottenham, and Wood Green, with powers to establish generating stations and supply electricity. The estimated cost of the land and buildings for the station is £175,000, and of the distributing system £225,000. The Bill contains the usual general provisions relating to the creation and working of a Joint Board for an undertaking of this kind. The proposed site for the works is in the parish of Edmonton.

The Leeds Corporation (General Powers) Bill contains a provision for borrowing an additional sum of £300,000 for gas-works purposes, repayable in forty years. The new loans may be raised by the issue of adequate amounts of Corporation stock. All loans are to be charged indifferently upon the whole of the Corporation property. A dividends fund is to be established, to provide for the payment of dividends, interest, and the annual sums on the principal moneys. The repayments are to be equated. It is proposed to have recourse to the redemption fund instead of fresh borrowing. Corporation stock is to be exchangeable for any outstanding security.

The Metropolitan Electric Supply Bill is to confer further powers on the Metropolitan Electric Supply Company, Limited, for the extension of the supply to the Metropol't n Borough of Paddington instead of the parish, and for the laying down of a second and additional system of distributing mains for conveying a high-pressure supply from the Willesden generating station. The main-laying provisions of the Gas-Works Clauses Act, 1847, are to be applied to this object.

The Notting Hill Electric Lighting Bill is to enable the Company to acquire additional lands for an electricity generating station in the Addison Road, Kensington, district.

The Shannon Water and Electric Power Bill is to incorporate a Company to establish an electric power station at Cloonlara, County Clare, for the supply of electrical energy in the city of Limerick and a radius of thirty miles from the end of the canal. The capital of the Company is to be £336,000, with power to borrow £180,000. The sum of £10,000 is to be subscribed before the powers for the compulsory purchase of land are put in force. The power is to be derived from the River Shannon, by an intake at Drummeen, in the parish of Kiltenanlea. A weir is to be made across the Shannon at Errina. A canal belonging to the Commissioners of Public Works is to be used. Interest on the cost of the works is to be payable out of capital during the construction. The charges for electricity are to range from 5d. to 2d. per unit supplied.

The Smethwick Corporation Bill contains a provision for enabling the Corporation to raise £50,000 of new gas capital, repayable in fifty years. A thrift fund is to be established for Corporation employees It is proposed to adapt the Corporation tramways to electric traction.

The South Yorkshire Electric Power Bill is to incorporate a Company with a share capital of £2,000,000, and power to borrow £666,666, for the purpose of generating and supplying electric power. Lands for the construction of generating stations are to be acquired compulsorily within five years, provided that £50,000 of capital is first subscribed. The district of supply is to be a portion of the West Riding, excluding the County Boroughs of Bradford, Leeds, and Sheffield. Energy is to be supplied in bulk to authorized undertakers, or for power to any person. The distributing mains are to be buried in a trench. The prices to be charged by the Company for energy supplied by them are scheduled. They are from 3d. per unit for 100 hours of the maximum demand, down to 1d. per unit for over 200 hours' supplies. There is a sliding-scale proposed, under which the Company are to take or allow 5s. per cent. for every 1¼ per cent. by which the average price charged in any year is below or above the standard price. The standard rate of dividend is 8 per cent. The Board of Trade will have the power to revise the prices of electricity, and the relation between price and dividend, at intervals of ten years. Supplies are to be metered. Interest is to be payable out of capital during the construction of works. The generating stations are to be situated at Thornhill, Pontefract, and Wombwell.

THE LATE PROFESSOR BUNSEN.

WITH the last number to hand of the "Journal für Gasbeleuchtung" was issued a portrait of the late Professor Bunsen, who died at Heidelberg on Aug. 15, 1899. The name of this distinguished Chemist is so well known (through his burner and photometer) to everyone connected with the gas industry that we have thought our readers would be interested in having a presentment of his lineaments. We therefore give a reproduction of the portrait. The life-work of Professor Bunsen was so fully noticed in the "JOURNAL" for Aug. 22, 1899, that it is unnecessary to go into any detail now. It has received world-wide recognition; and its effects cannot be effaced by time.

OBITUARY.

SAD BEREAVEMENT OF MR. ALEX. C. HUMPHREYS.

IT is with feelings of pain and sympathy that we have heard of a terrible loss which Mr. and Mrs. Alex. C. Humphreys, of New York, have sustained, and of the sorrow into which they have been plunged. At one sudden stroke, they have been deprived of their two sons—one who had just entered manhood, having equipped himself for taking his part in the work of life with a distinction of which his father was justly proud, and the other the much-loved child of the family.

The circumstances are indeed deplorable. In quest of needful rest and change, Mr. Humphreys was in Egypt with his wife and family, and, after ascending the Nile to Assouan, had started on the return journey to Cairo by Messrs. Cook and Son's steamer "The Rameses." About 10 o'clock on the morning of the 12th inst., when about half-way between Assouan and Luxor, the younger son, Crombie (who was in his seventh year), while running from a little companion on deck, slipped through the rail, which half way up its height was screened by wire-netting, the other half being open. The whole family were quite near at the time; the mother seeing the accident. The little fellow's elder brother, Harold (who was in his twenty-fourth year), hearing his mother's cry of distress, without hesitation, jumped overboard. Mr. Humphreys ran to the stern of the boat for the same purpose; but the knowledge of his eldest son's strength and capacity as a swimmer decided him to man the boat he found towing astern as the surer means of assistance. He felt confident that Harold with Crombie would be able to reach a life-preserver promptly thrown overboard in their immediate vicinity. The boat, however, was found to be unprepared for prompt use; and the helplessness and excitability of the Arab crew in such an emergency wasted priceless time. To add to his dismay, after having unshipped the oars, Mr. Humphreys found that the steamer was still towing the boat ahead as fast as ever. He rowed to the spot where his sons had entered the water, and after a brief search he found Crombie. Possibly his life might have been saved, had not Mr. Humphreys felt he must continue the search for Harold, who it is now supposed struck his head against the side of the boat when plunging into the water. Another boat was sent to the parent's aid; but it was not until two hours afterwards that Harold's body was recovered by some fishermen. Meanwhile, Crombie had been taken back to the steamboat; and for two hours the attempt to resuscitate him was continued. But in vain; the poor little fellow was dead.

Mr. Humphreys feels very deeply the untiring kindness of the ship's doctor, and all of his travelling companions, through whose co-operation the bodies have been preserved, and are now being taken to America.

Sad as are these circumstances, they are rendered still more so by the fact that within the past two months Harold had been married; and his bride was also of the party.

It will interest professional readers to know that Harold graduated two years ago from the Stevens Institute of Technology, and was the first son of a graduate to go through the College. In the year of his father's presidency of the American Gaslight Association, he became an associate member. The aim of his training, and apparently his ambition, was that he should occupy the position of personal assistant to his father; and when his parents returned to America (as they expected to do in April), it had been arranged that he should remain in England for a year's constructing experience with his father's partner, Mr. A. G. Glasgow, after which he was to return to America to assist his father with his consulting connection. He bid fair to follow in his father's footsteps. By his death, a promising ornament of the American gas profession has been removed. With the sorrowing ones who yesterday commenced their sad homeward journey, the compassionate thoughts of our readers will go.

PERSONAL.

Mr. A. WELFORD, of the Selby Gas-Works, has been appointed Manager to the Howden Gas Company.

Mr. GEORGE KEYTE, Superintendent of the Shields works of the South Shields Gas Company, has been recommended by the Workington Gas Committee for the position of Gas Manager, in succession to Mr. J. Johnston.

The agreement which has existed between Mr. THOMAS CASH and the Eveson Coal and Coke Company, Limited, and their predecessors for a long period of years, terminated on the 12th inst.; and Mr. Cash has since commenced business on his own account. We may join many other friends in wishing him every prosperity.

We learn that Mr. ALBERT FORD has been re-appointed Manager of the Singapore Gas-Works, which, as our readers are aware, have been acquired by the Municipality. We congratulate Mr. Ford on retaining his position; and while doing so venture to express the opinion that the new owners of the gas undertaking have done the wisest thing possible to ensure its success.

Invited by their chief (Mr. J. T. Jolliffe), the staff of the Ipswich Gas Company dined together at the offices last Saturday week. The immediate object of the occasion was to do honour to one of the members, Mr. FRANK M. PATERNOSTER, who (as already announced) has been appointed Manager of the Felixstowe Gas Company. During the after proceedings, Mr. Jolliffe, in the name of the staff, presented Mr. Paternoster with a token of good will esteem, and friendship, in the form of a handsome marble timepiece suitably inscribed.

It was announced at the meeting of the Leatherhead and District Water Company last week, that Mr. H. ROKEBY PRICE, the Chairman, had severed his connection with the Board. A change has also been made in the secretaryship—Mr. JOHN YOUNG having been appointed in the place of Mr. THOMAS HAYNES, who has been compelled to resign his position owing to the infirmities of age. The Directors have granted Mr. Haynes a retiring allowance of £25 per annum, in consideration of his long and valuable service with the Company.

The friends of Mr. ISAAC CARR will regret to learn that he has not been able to shake off the effects of a bicycle accident he sustained last August in the course of his duties, and that a period of rest from professional work is necessary. He has been granted leave of absence for a month, and will leave England for the Canaries on Saturday next. Reference to the matter at the last monthly meeting of the Widnes Town Council evoked from Mr. Smith an expression of the sincere desire of every member that Mr. Carr might return fully restored to health. In this desire we cordially join, and trust, with Alderman Timmis, the Chairman of the Gas Committee, that the voyage they are enabling their Engineer to take will be the means of thoroughly invigorating him, and "of ensuring to them a long continuance of those valuable services which have rendered their town notorious for its possession of the cheapest gas supply in the kingdom."

NOTES.

A Carbolic Acid Paint for Woodwork.

What is "Carbolineum Avenarius?" The query about this stuff was originally put in the correspondence columns of "Engineering," by an anonymous inquirer, who asked for information as to the results of its use as a timber preservative. It was introduced into this country some 12 or 14 years ago. The answer to the question came from Mr. Oscar Guttmann, of Mark Lane, who stated that he uses the preparation for painting wooden buildings, chiefly those of which explosives factories consist, and thinks very highly of it. For seventeen years it has protected such buildings, both in this and in warmer climates, as well as tarring. The coating perishes by the action of the sun, in time, and wants renewing about once in three years. Crude carbolic acid, said to be the chief constituent of the carbolineum, has been tried alone; but not with such good result. The English agents for "Carbolineum Avenarius" are stated to be Messrs. Peters, Bartsch, and Co., of Derby. Further good effects are claimed for the preparation by Herr G. Diechmann, of Berlin, who says it is extensively employed throughout Germany. It is therefore evidently another German speciality made from tar—probably English coal tar.

Compressed Air Tramcars.

It is recognized that for certain purposes compressed-air power machinery is better than any other; and, according to an American technical journal, one of these is the working of short lines of street tramway, auxiliary to long electric lines. It should for the same reason be useful on works tramways. It appears that in New York compressed-air driving is employed for a short cross-line of tramway. In this case, nothing else but compressed air is used on the line; there being no horse or electric traction service. The plant put down was experimental; and the best working conditions were neither known nor realized in regard to the power equipment. The compressing machinery is three times larger than experience shows to be really required for the work; and the staff could do more work than there is for them to do in connection with this single line. Yet, notwithstanding all drawbacks, the running expenses averaged last year, including everything, 17·42 cents. per car-mile. The cost of horse car tram lines in the same locality was 18·98 cents. per car-mile; the cars besides being much smaller than in the case of other systems. The cable cars cost 17·76 cents., and the electric cars 13·16 cents. per car-mile, including all expenses of operation and maintenance. These two figures are taken as representing the best that the respective systems can do under existing conditions, whereas the air cars might do a great deal better if they were worked to proper advantage. This result is very gratifying to those who hold that compressed air power has still a future before it.

The Species of Petroleums.

Mr. S. F. Peckham has discussed the problem of the classification of crude petroleums. The question for experts has been whether petroleums of different origin are all of one and the same species—whether, that is to say, petroleum is petroleum—or whether there are different kinds of this mineral. Differences of degree are, of course, many; but it was contended that difference of kind does not exist. Mr. Peckham takes the contrary view, holding that petroleums of some fields differ in nature from others,

and require special treatment. His suggested system of classification, with recognition of these differences, embraces the natural bitumens, and extends to natural oil gas. There are now four, if not more, types of petroleum recognized for commercial purposes. These are: Paraffin petroleums, Russian petroleums, sulphur petroleums, and nitrogen petroleums. It is insisted that every unknown sample of crude oil should be analyzed, with the object of ascertaining to which of these classes it should be assigned. The paraffin petroleums are the most valuable for all the more important uses, as containing most hydrogen. Chemical science has not yet shown us the way to add hydrogen to any compound deficient in this element. On the other hand, the more nitrogen there is in an oil, the less valuable it will be for burning or gasifying. Complete analyses of petroleums in the sense indicated are more tedious and expensive than the usual practice of retorting into fractions regardless of the character of the portions so separated; but Mr. Peckham thinks the results are worth it.

Contrasts of Colour in Iron Painting.

Some hints on the painting of ironwork and machinery have appeared in the "Oil and Colourman's Journal." It is suggested that on the small iron fittings of buildings exposed to the weather, the red rust which is generally conspicuous can be converted into what is practically a paint by the application of boiled linseed oil over it. Iron articles may be protected by steeping for a few minutes in a solution of common blue stone in water, and afterwards dipping in a solution of hyposulphate of soda acidulated with hydrochloric acid. The result is a blue-black coating, not affected by air or water. It is also remarked that great lack of taste is often shown in the choice of contrasting colours for ironwork and machinery, which might easily be corrected. Machines and structures have been seen in which bright gaudy reds and blues and yellows are mingled in a bewildering fashion. This might be avoided by paying heed to the rule of colour decoration that one tint must be kept in subjection to the other; and that complementaries are most harmonious. Nature teaches us this in the colouring of variegated foliage, stems and leaves, moss and bark, and so on, always without a jarring note. Thus the complementaries of red are green; of blue, orange; and of yellow, violet. The precise tint of the complementary, however, is determined by that of its positive. The following hints are given, to be interpreted by the seeing eye: Black and warm brown, violet and pale green, violet and light rose, deep blue and golden brown, chocolate and bright blue, deep red and grey, marone and warm green, deep blue and pink, chocolate and pea green, marone and deep blue, claret and buff, black and warm green, slate colour with any bright tint except blue, buff and black, and buff and blue or mauve. This list ought to have effect in improving the appearance of street lamp-posts, or even gasholders and iron bridges.

The Manhattan Power House.

The issue of the "Engineering Record" for the 19th ult. contains a succinct account of the great power station of the Manhattan Railway Company, of New York, which is the largest example yet furnished of the conversion of a steam railway to electric traction. The lines operated by the Company are the whole of the so-called "elevated" railways in New York, hitherto worked by steam locomotives. Henceforth the service will be electric; the power being transmitted by a third rail. The generating station is situated on the East River—an ideal position, where coal can be brought alongside, ashes barged away, and any quantity of clean condensing water obtained. The station is, besides, at the common centre of gravity of the trains to be moved; so that the transport conditions are exceptionally advantageous. The present station is designed for a maximum output of 100,000 horse power; but there is room for 50 per cent. more. It occupies a plot of ground 204 feet wide and averaging 555 feet deep. The coal-pockets of the boiler-house are immediately under the roof, so as to command the furnaces by gravitation. The coal trickles down to the dead-plates of the Babcock and Willcox boilers, 64 in number, all of 500-horse power nominal. Roney mechanical stokers will be used. The boilers are fitted with Green's economizers. As an emergency provision, there is a complete Sturtevant forced-draught equipment. The E. P. Allis Company's steam-engines are in 8000-horse power units, eight in a row. The engines are of novel type, described as compound horizontal and cross-compound vertical. Each set virtually comprises a pair of engines on opposite sides of the main shaft; the high-pressure cylinders being horizontal, and the low-pressure cylinders vertical. The advantages of this type are compactness and economy of bearings. Jet condensers are to be used at first. The electric machinery comprises three-phase alternators, working at a pressure of 11,000 volts; the current being delivered to step-down rotary transformers, which convert it into direct current at 625 volts for use from the third rail. The great alternators are 42 feet high; the diameter of the revolving part being 32 feet, and its weight 370,000 lbs.

Gas and Water Exhibition in Vienna.—The Acting Consul-General for Austria-Hungary has notified through the Press that from May 25 until June 25 next an exhibition will be held in Vienna at which foreign exhibits will be admitted. It will comprise all appliances appertaining to the use of gas and water—a special and important section being devoted to sanitary arrangements. Intending exhibitors should apply for further information to Director G. Hartberger, in Wien. I., Weihburggasse 14.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham, under the presidency of Mr. Thomas Glover, of West Bromwich. There was a fair attendance of members, who gave their new President a very hearty reception on taking the chair.

The Hon. Secretary (Mr. Charles Meiklejohn, of Rugby) opened the proceedings by reading the minutes of the last meeting, which were unanimously confirmed.

New Member.

The election of Mr. Frank Parsons, of Rowley Regis, as a member was also agreed to.

Annual Report and Accounts.

The President said the next item on the *agenda* was the presentation of the annual report and accounts. The members had, he said, all received copies; and therefore, he thought they might, as usual, be taken as read. It was very gratifying to see the Association were in such a good position.

The report (which was the twenty-third) reviewed the work of the year. The Committee recorded with regret the loss the Association had sustained by the death of the late Hon. Treasurer, Mr. Peter Simpson. It was also mentioned that the roll of membership had been extended by the addition of twelve new names during the year; making the total 96. The report concluded with an earnest solicitation for the active interest of the members in furthering the technical work of the Association by the contribution of papers. The accounts showed a balance of £107 19s. 6d. in hand.

On the motion of Mr. William North (Stourbridge), seconded by Mr. William Winstanley (Newcastle-under-Lyme), the report and accounts were adopted.

The President then delivered his

Inaugural Address.

Gentlemen,—My first duty as your President is to thank you for the honour you have conferred upon me, an honour I feel all the more as I have been among you as a member of the Midland Association for a comparatively short period, and have to succeed (and precede, I trust) men who have risen to eminence in the profession of gas engineering. However much I may doubt my own fitness for this, the highest office in the Association, I need hardly assure you of my hearty interest in all that pertains to its welfare, and my deep concern in the questions which confront the gas industry at the present time. With the assistance of our worthy Secretary and the Committee, I trust the proceedings of the Association may be profitable throughout the year.

The preparation of the Presidential Address is always, I fancy, a formidable task. Whether it is the overwhelming feeling of responsibility which is indefinably felt as attaching to words from the chair, or the variety of subjects to be treated of, in any case it is not work which can be lightly approached. At the present time, the difficulty of focussing one's ideas appears to be greater than usual. Whether we confine our thoughts to our own particular industry, or consider it in relation to other industries, or in relation to municipal enterprise and social welfare, or in relation to national methods and recent criticism—from whichever point of view it is regarded, there is a consciousness of impending change, and the necessity of readjustment of old ideas and theories.

In our industry we seem to have reached a point in manufacture at which there appears to be little chance of further reduction in cost, without a radical change in the methods employed. The great question which we shall have to face early in the present century is, in my opinion, the popularization and application of gas to the fuel requirements of our town communities.

There are several reasons for believing this to be the case. First, the great strides already made in accustoming the public to the use of gas for cooking is likely to lead to a still greater demand for the same purpose; also for house warming, provided the cost be approximately the same as for coal. The present need for a cleaner town atmosphere is also likely to draw public attention to the claims of gas to be considered as a cure for the present baneful smoke nuisance. This subject will be treated in greater detail at a later stage. At present it is sufficient to say that if gas can be applied in a really effective manner for this purpose, the demand will be an enormous one.

In the second place, there is, among eminent engineers, an increasing belief in the future of the gas-engine as a prime mover. Cheap power is of the first importance to the welfare of our country; and this has lately become accentuated, as our position as a great manufacturing community is being subjected to keen competition by countries either possessing great natural resources or the wisdom to use less bountiful resources to the best advantage. The roundabout method of utilizing the heat energy of coal through the medium of a steam boiler and engine is admitted to be wasteful and unnecessarily costly. For the large electric power stations, which are likely to come into existence early in the new century, every fraction of a penny saved on the cost of a

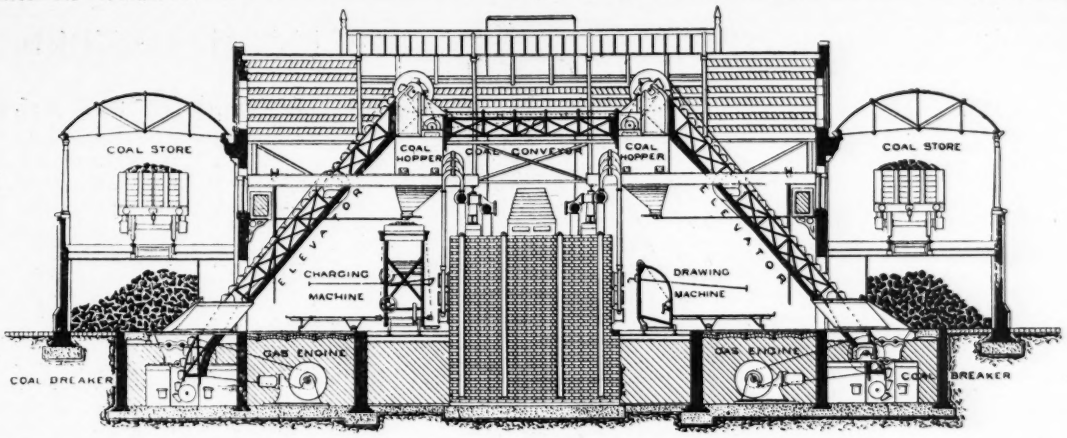


FIG. 1.—CROSS SECTION OF THE WEST BROMWICH RETORT-HOUSE.

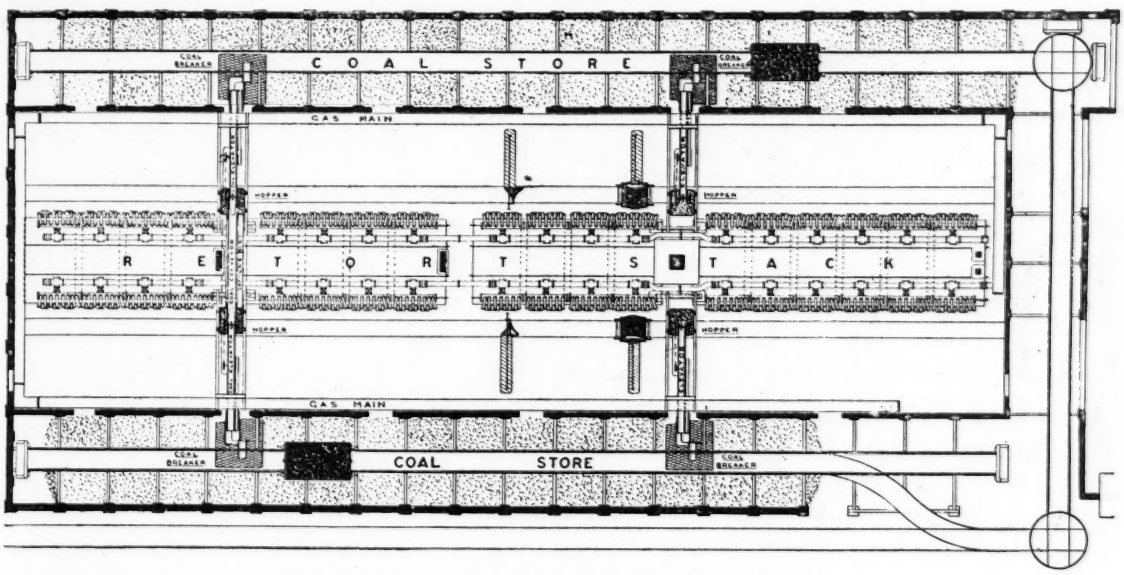


FIG. 2.—PLAN OF THE WEST BROMWICH RETORT-HOUSE.

unit will amount to a large sum of money in the aggregate. With the small manufacturer also, the cost of production is influenced to some extent by the cost of his fuel supply. For the latter, town's gas at the usual selling prices, with modern engines, has been found more economical than steam. For the larger plants, however, if a cheaper gas be not provided from a central source of supply, the user will only realize the full benefit of gas-engines by manufacturing a cheap power gas.

In view of the prospect of a future large demand for fuel gas, to supply the multifarious demands of town communities, it is desirable to retain the large gas-engine consumer by granting concessions as regards price, for undoubtedly this class of consumer can be supplied at a much less cost than a consumer who uses gas for only a comparatively few hours in the year. How far it is equitable to proceed in granting concessions, is a question upon which experts are not in agreement. If, however, we are to make the progress which is desirable in this new line of business, we must be prepared to revise our views, not only upon methods of manufacture, but also upon the proportion of certain charges usually debited against all classes of consumers alike.

The proposals of a powerful Company to manufacture and distribute Mond producer gas from various centres in this neighbourhood are interesting, not only as an outward and visible sign of great changes to come in the application of fuel, but as revealing the opinion of fresh minds, not biassed by ordinary gas-works practice, as to the price which will cover dead-charges and the cost of distribution, and leave a surplus for profit. In my opinion, there is nothing in these proposals to cause us any undue alarm. It is extremely unlikely that it would pay to lay special mains to pick up isolated gas-engine consumers, who are at present well served from the town mains. The gas is of a low calorific value (148 B.T.U.), and is therefore unsuitable for domestic heating. The large volume and character of the fumes given off would prohibit the use of the gas, except where ample ventilation was available. The size of pipes and the pressures to be used for the distribution of so weak a gas would be further disadvantageous. For these reasons, it is not an ideal fuel gas for general distribution; and its claims will receive little consideration from our present consumers, provided a stronger gas can be obtained at anything like an equivalent price.

The ideal fuel gas is undoubtedly that known as natural gas, and consisting principally of methane, with a heating value of 1000 B.T.U. In the present state of our knowledge, it is impossible to produce this gas on a commercial scale. The nearest approach is the product with which we are all familiar, that obtained by the destructive distillation of coal, and having a calorific value of from 600 to 700 B.T.U. A recent test of 17-candle gas at West Bromwich gave 645 B.T.U. Moreover, the luminous flame of the coal gas constitutes a valuable asset in its favour compared with the non-luminous methane.

Although I have thought it advisable to point out some of the limitations attached to the distribution and use of Mond gas, I do not wish it to be understood that I should agree to an antagonistic attitude being shown towards any company who can demonstrate in a business-like way that they have a remedy to offer for the present wasteful use of fuel and the atmospheric pollution which characterizes our great manufacturing centres. In former times the disposition of manufactories has been largely decided by the facilities for transport and for obtaining cheap fuel supplies. It is only reasonable to expect that something like this will occur again. We may also expect that the fuel-gas companies, whose capital and working charges will be chiefly for distribution, will make their scale of charges according to distance as well as for quantity consumed. In that case we shall find in time the iron-works, brick-works, and glass-works being grouped round the Mond gas-works, in order to realize the full benefit of cheap gaseous fuel of constant quality and pressure, made and supplied under the supervision of specially trained engineers. The surroundings of such manufacturing centres, instead of being dirty, squalid, and depressing, would be clean and bright, and the conditions of life for the employees would be much improved.

With improved conditions of life, there will arise a greater demand for artificial light, and for gaseous fuel for household purposes; so that the proposals of the Mond Company may be treated by us in a friendly spirit, if proper recognition can be secured for our existing rights. This spirit of friendliness will be the more readily granted if we can be assured that the business now done with gas-engine consumers is not likely to be diverted in favour of the new comer, and if the operations of the Company are limited to the outskirts of the town, where the large manufactories are for the most part established.

The claims of water gas, either with or without an admixture

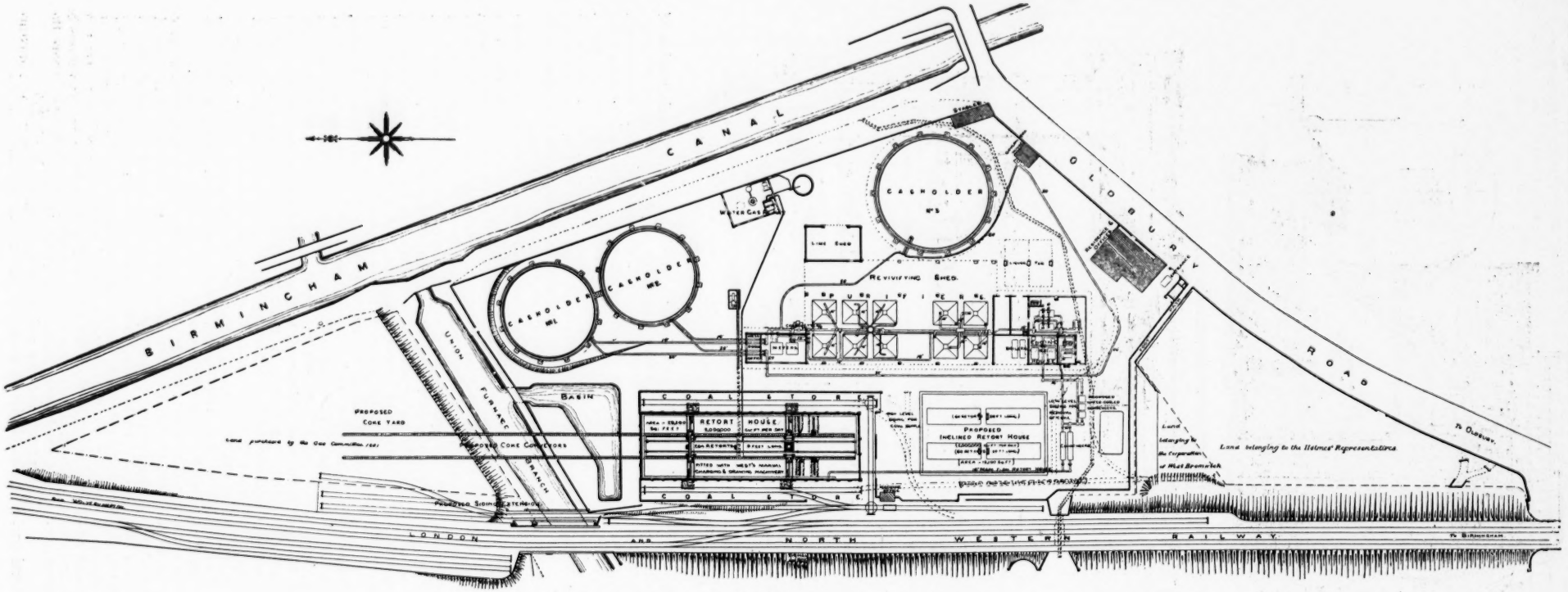


FIG. 3.—PLAN OF THE WEST BROMWICH GAS-WORKS.

of oil gas, for general distribution may be briefly reviewed. The blue gas, unenriched, has a calorific value of about 280 B.T.U. It could be manufactured and put into the holder at about 9d. per 1000 cubic feet less than coal gas. The cost to the consumer would be 9d. less than is now paid; but the quantity required to do the same amount of work would be about twice that of coal gas. The large percentage of carbonic oxide which it contains is sufficient, however, apart from cost, to debar its popular use. With an admixture of oil gas, its calorific value approximates that of coal gas; but the cost of the oil for enrichment in the Midlands is a serious item—sometimes amounting to the total cost of manufacturing coal gas. It is expected that, by benzol enrichment and the economies of the Dellwik plant, the cost will be reduced to about that of coal gas. With either method of manufacture or enrichment, an installation of water gas can only be regarded as a useful adjunct of greatest value for conveniently getting over the peak of the winter load.

Having considered the quality of gas which will satisfy the public demand, we may now discuss questions relating to its manufacture, distribution, and application, which are likely to favour its wide adoption for the purposes I have sketched, and enable us to choke off threatened competition. The main factors controlling the selling price of gas may be briefly stated—viz., (1) The relative value to the coal obtained for bye-products. (2) Labour and management charges for manufacture, distribution and administration. (3) Capital charges.

In the early days of our industry, the products resulting from the distillation of coal, other than gas, were regarded as a troublesome accompaniment. Chemical discoveries and the requirements of industry afterwards created a demand to such an extent, as in some cases to make the amount realized for residuals balance with that paid for the original coal. The efforts of the engineer have also produced important results in reducing the cost for coal. By the introduction of the generative and regenerative systems of heating retorts, by the careful removal of ammonia and subsequent manufacture into sulphate, the returns for two important residuals have been materially increased. With reference to tar, it has not hitherto been regarded as a part of the gas engineer's duty to become distiller; nor is it desirable, so long as a fair price can be obtained for the crude material. Sales effected on a sliding-scale, rising and falling with the value of the chief product resulting from its distillation, will probably satisfy both the producer and the distiller. It must be noted in this connection that the gas-works are no longer the sole producers of tar and tar products; the proprietors of recovery coke-ovens are becoming serious competitors both in tar and ammonia products. This subject, however, demands our careful attention; and I will revert to it at a later stage.

It is an appropriate time, after a hundred years' development, to ask what may be regarded as the best results obtainable in practical work. So far as my own experience goes, and taking the results obtained over two years, I regard the following as about the maximum.

For two years ending March 31, 1899, per ton of 2240 lbs. of coal: Gas made, 11,102 cubic feet; tar, 11·5 gallons; liquor, 10 oz., 33·2 gallons; coke sold, 10·3 cwt. Illuminating power of gas at testing-station, 16·25 candles. Cannel used, 3·15 per cent.

The coals were carefully selected both for their gas and coke making properties; the carbonizing is done in retorts 22 in. by 16 in. heated on the gas-fired system; no hydraulic main is used; and the charging is done by West's manual machines. The general arrangement of the retort-house and machinery is shown in figs. 1 and 2.

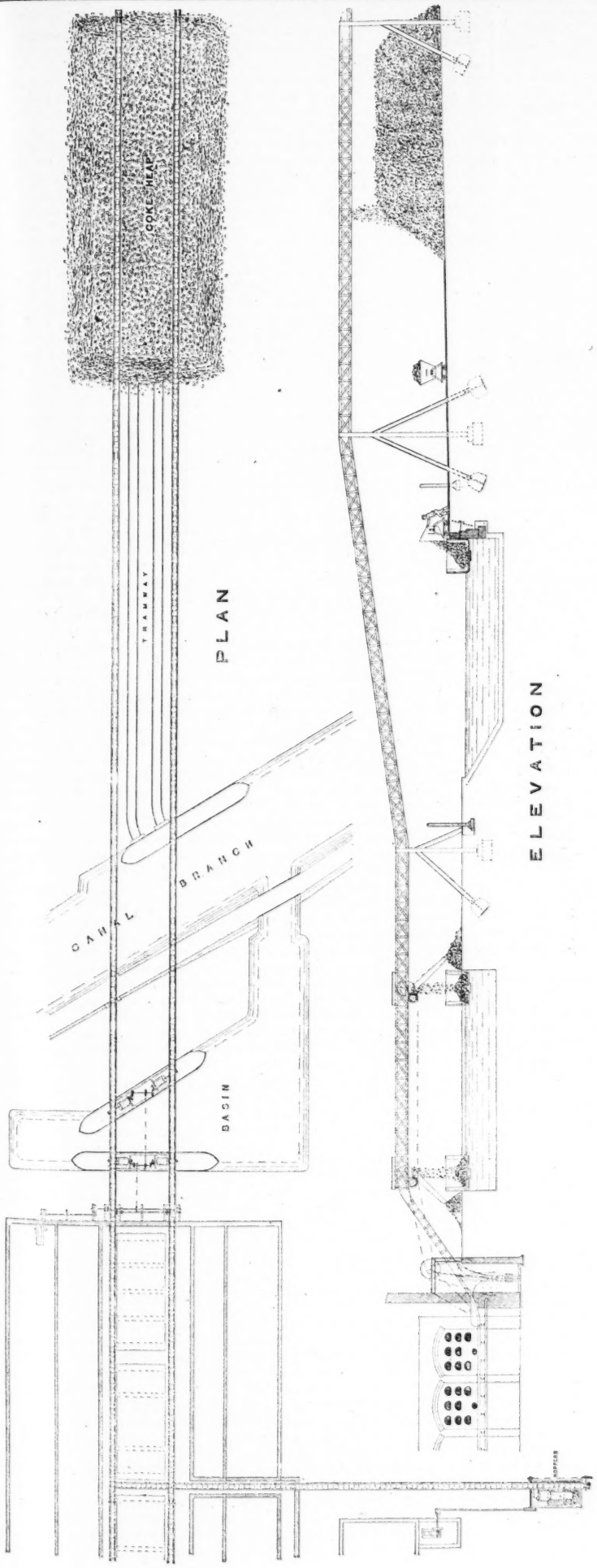


FIG. 4.—APPLICATION OF CONVEYORS FOR REMOVING CORE FROM A RETORT-HOUSE OVER TWO CANALS, SHOWING POSSIBLE ARRANGEMENTS FOR STOCKING, LOADING BOATS AND CARTS, ETC.

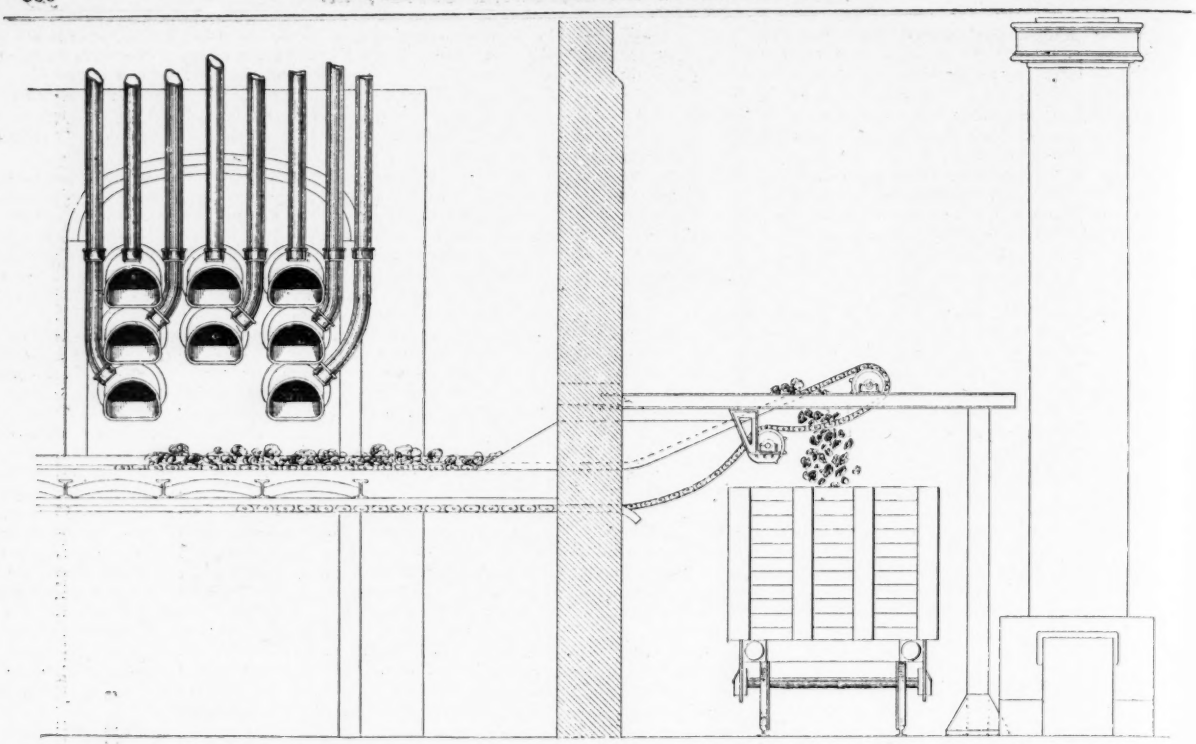


FIG. 5.—METHOD OF REMOVING COKE FROM AN INCLINED RETORT-HOUSE WHERE YARD-SPACE IS LIMITED.

During these two years the cost per 1000 cubic feet of gas made, for coal, less residuals, was 2·97d. Labour, purification, and other charges made the cost 10·15d. into the holder. These costs are by no means so favourable as those for one or two works situated near the coal-fields, where the cost into the holder is frequently under 6d. per 1000 cubic feet; the residuals realizing over 90 per cent. of the original cost of coal.

Two important questions affecting the cost of manufacture are, therefore, cost of labour and value of residuals. It would be a sad reflection on the mechanical genius of our age if the satisfactory handling of coal and coke had not been accomplished. Fortunately, this cannot be said. But it may be questioned if the advantages which accrue from the use of machinery are fully realized by all gas engineers. The published comparative analyses of accounts reveal a wide divergence in labour costs. Carbonizing wages in one large undertaking cost 5d. per 1000 cubic feet of gas sold, against 2¾d. in another works of moderate size. If the comparison could be carried further, and the labour costs obtained on the handling of coal and coke, from the time the coal is received to the coke being discharged into trucks, the figures would doubtless be significant.

The substitution of machinery for laborious manual work is becoming of greater importance with the advance of education; and this we may regard as, on the whole, a good sign. It should be our endeavour to make work light, and to encourage the use of brains as well as muscle. The type of machinery and the amount spent on its installation must, however, be adapted, and should be in proportion, to the work requiring to be done. Otherwise the charges will more than absorb all the saving.

The difficult problem of removing hot coke by mechanical means has now been solved; but it does not follow that every small retort-house should be fitted with these appliances. For many horizontal houses the best coke-conveyor is a man with a well-designed barrow. Even in this simple operation, there is room for mistakes. What could be more roundabout than drawing coke on to a floor, filling it with shovels into barrows, and wheeling it out? Unnecessary labour is involved, and the coke is depreciated by additional handling.

For difficult situations, and for inclined benches, as shown in figs. 3, 4, and 5 coke-conveyors of the De Brouwer or some similar type will be of great value.

In laying out extensions, the relative merits of inclined retort-settings and those set horizontally, *plus* machinery, will have to be carefully considered. It is impossible to dogmatize in a general way, as so many circumstances control the ultimate results obtainable. It has not been satisfactorily settled to my mind whether the "sloper" is as good a gas-maker as the horizontal, nor how much the additional cost will be for repairs and maintenance. Significant whispers are sometimes heard on the latter point; and we also hear of very great care being exercised on the part of contractors not to overheat retorts. The loss of a few hundred feet of gas per ton does not, however, count for much, provided that there is an increased yield of residuals. Moreover, recent erections have shown a decided improvement upon those first constructed, as regards strength of ties, disposal of brickwork, and shape of retort. There is a fascination about the system; and some of the advantages cannot be overlooked, especially under circumstances which will be understood on reference to fig. 3.

For smooth working and all-round good results, I do not expect to improve upon our present system. Stopped pipes and pitched-up mains are practically unknown. For the past five years the stokers have worked in harmony with the management, on terms which I believe are mutually advantageous. A blending of firmness with a due consideration for the men's self-respect and comfort is the recipe I recommend for relief from labour agitations.

Stopped pipes, labour troubles, and naphthalene have been in past times the bane of many a gas manager's life, and have each contributed a share to the cost of producing and distributing gas. I wish now to say a word or two on the last-mentioned point. I think it will be admitted that the first serious attempt at an understanding of the cause of naphthalene troubles was on the occasion of my reading a communication before the Gas Institute in 1897. Since that time, both in this country and in Germany, the remedies then advocated have been applied on a working scale, and have proved successful. The method most in favour at present is the second one in the above paper—viz., washing the naphthalene-charged gas with a supplementary quantity of oil, in a similar manner to that employed for the removal of ammonia.

There is no doubt about this being a rational and effective method of dealing with naphthalene. At my own works, it has not been convenient to put this system into permanent use; but I have found considerable relief from carburetting the naphthalene-charged gas with oil vapours having approximately the same vapour tension as naphthalene. This is a certain remedy, if applied under suitable conditions and for a sufficient length of time to enable the condensed oils to dissolve existing deposits. It is a mistake to believe that all the naphthalene contained in the gas being made is removed at the condensers during the winter season. Effective condensation will mitigate the evil; but unless the gas is accompanied by sufficient condensable vapours, the oils which go to make the tar are all saturated in the early stages of condensation, and are therefore of no use as absorbents of naphthalene. An examination of the meter and holder connections during winter will frequently reveal newly-deposited naphthalene, causing no trouble, it may be, at the time, but ready to be revolatilized and deposited in the distributing system during the warmer days of spring and summer. Purifying material in catch purifiers, if examined, will be found to contain a large quantity of crystals after the gas has been passing through at a low temperature for any length of time. It follows, therefore, that any process which is applied as a remedy must be carried on at least twelve months before any pronouncement can be made as to its efficiency.

It is a source of gratification to me that I have been associated in the work of elucidating this problem with Mr. William Young, of Peebles. His great ability as a physicist has been brought to bear on the subject in an unstinting manner; and he has thus conferred a lasting benefit on the industry.

Neither the removal of naphthalene or other impurities, the cost of which comes under the heading of purification, greatly affects the total cost of producing gas. Improvements in our methods of purifying gas, however, are urgently needed. The process of purification, although done in larger vessels and with greater system now than formerly, is essentially the same as in the early

days. Chemists are agreed that the crude gas contains the necessary elements for its own purification, and the use of bulky solid material ought therefore to be unnecessary. It should not be beyond the ability of chemical engineering science to apply the principles successfully, and so do away with the dirty cumbrous methods now employed. For this purpose, some of the wealthy gas companies or corporations owning gas-works might devote a portion of their profits, either individually or jointly, to the construction and working of a plant to completely purify (say) 250,000 feet of gas per day. The mechanical detail could be studied, and the proportions altered on a plant of this size without involving too great an outlay. The whole gas industry of the future would be greatly benefited, as the disposal of waste material will, in time, become a serious difficulty.

On the question of enrichment, it is impossible to lay down any hard-and-fast rule applicable to all circumstances. Illuminating power cannot be ignored; to do so would injure our case as suppliers of the best medium for producing cheap and convenient illumination. Nor must we overlook the fact that the illuminating power to many consumers means that degree of illumination which is obtainable from one or more flat-flame burners; and some regard must be paid, therefore, in fixing a standard of quality, to the fact that flat-flames for many situations cannot be replaced by any other form of burner, and that the gas must be supplied suitable for developing a satisfactory light with a reasonable consumption. Probably the best-known examples of artificial lighting with luminous flames are to be found on the main-line trains of our leading railway companies, where gas of about 40-candle power is used. I have also seen very effective house lighting done with the same quality of gas. As a contrast to this, I may say that I had on one occasion to superintend the lighting of some colliery buildings with gas of 6-candle power. The supply was obtained free of cost from the workings. Neither quality of gas is suitable for general distribution to meet all the requirements of our consumers. When used through a flat-flame burner, unenriched, the 6-candle power gas must be burned with a large thick flame if any appreciable light is to be obtained.

With whatever quality of gas, the burner is an important factor, and in the hands of the ordinary consumer the tendency appears to be to give least attention to the burner where the quality of gas is highest; and complaints of poor gas are quite as frequent in towns where 18 to 19 candle gas is supplied as in those towns where 16 to 17 candle gas is the standard. In my opinion, it would not be a prudent course to adopt a standard much below this figure, while enrichment can be obtained so readily, and at the moderate cost of ½d. per candle-thousand, as is now done by the use of benzol. My experience with this method of enrichment has been very satisfactory, and provided the price remains at about the average of the last year, there will be no temptation to return to cannel coal for the candle or candle-and-a-half of enrichment usually required. To bestow so much care on producing gas yielding a highly luminous flame, and then to deliberately destroy the luminosity for the purpose of producing a smokeless heat flame, will be an illogical proceeding, when the greater part of our gas is used through bunsen burners. If, therefore, the time comes when the incandescent system of gas lighting and electricity shall have displaced the flat-flame burner, and the output of gas for other purposes than lighting has reached the dimensions which we may reasonably anticipate, the question of illuminating power will occupy a position of less importance than is now the case. For the present, we may console ourselves with the knowledge that in adding candles we are also adding heat units, although not proportionately. The following table shows the results of experiments conducted in the laboratory of the Albion Gas-Works with gas of varying illuminating power :—

Calorific Value of Gas at Various Illuminating Powers.

Test No.	Illuminating Power.	Calories.		B.T. Units.		B.T. Units per Candle.	
		Gross Value.	Corrected for Condensed Water.	Gross Value.	Corrected for Condensed Water.	Gross Value.	Corrected for Condensed Water.
1	5·97	147·05	131·25	583·78	521·06	97·78	87·27
2	13·12	147·96	131·33	587·40	521·38	44·77	39·73
3	13·85	148·89	133·15	591·09	528·60	42·67	38·16
4	14·24	151·37	135·53	600·93	538·05	42·20	37·78
5	16·51	154·60	137·80	613·76	547·06	..	..
6	17·22	162·67	143·75	645·79	570·68	37·50	33·14
7	18·25	163·98	146·73	651·00	582·51	35·67	31·91

To return to our consideration of costs, the efforts of the engineer to keep down cost of distribution may affect the selling price to the extent of a ½d. to 1d. per 1000 cubic feet. Economy will be promoted in working expenses by laying mains on both sides of thickly populated streets, under the footpaths. In this position the mains are not subjected to the crushing weight or vibration from passing traction engines and other heavy loads; and there will be no long wrought-iron services subject to rapid corrosion. Repairs of mains and services would thus be reduced to a minimum. Where wet meters are in use, cast-iron cases will be found to last much longer than tin-plate, and the amount spent on repairs will be reduced by less frequent renewals. It would be very unwise to attempt to carry economy too far with regard to inspection and repair of meters. Consumers' complaints are likely to be frequent, and the percentage of unaccounted-for gas will be high, if sufficient care is not bestowed on this department. The cost of inspection and distribution generally per 1000 cubic feet sold ought to be favourably affected by the increased consumption per consumer which follows the introduction of gas-heating appliances.

Rents, rates, and taxes are items for the most part outside our control. The question of rating was ably dealt with by our past-President, Mr. Reeves, in 1899; and I have nothing new to add to the remarks he then made. The cost of management appears to be about ½d. per 1000 cubic feet less under corporations than under companies, due to directors' fees and larger salaries under the latter. Increased consumption per consumer ought to reduce the cost under this head also.

On the question of capital charges, there is so much to be said that one feels a reluctance in approaching it. The published analyses of accounts reveal a very wide divergence in the amount to be earned per 1000 cubic feet of gas sold to cover these charges, both for municipally owned works and those owned by companies. It is easy to pick out the undertakings belonging to corporations where the beneficial effects of the redemption fund have been supplemented by the application of surplus profits for the benefit of the undertaking. In several cases the amount is between 3d. and 4d. per 1000 cubic feet of gas sold, as against 13d. and 14d. in some undertakings where transference of profits to the relief of the rates is practised. The average of the three large Metropolitan Companies is 11·24d., while one Suburban Company is as much as 16·98d. If the full benefit of a cheap gas supply is to be realized, expenditure on capital account must be kept within reasonable limits. I do not think our consumers will thank us for indulging in picturesque constructions. Good taste and proportion are not necessarily costly; and our works may be made to compare favourably with those carrying on similar operations without incurring lavish expenditure.

Capital account per 1000 cubic feet sold will be reduced by levelling-up the summer load, and by the fuller employment during the daylight hours of our distributing plant. The use of high-pressure feeding-mains during hours of heaviest consumption will, in many cases, enable us to avoid the laying of large trunk-mains, and so keep down capital expenditure.

But the greatest relief from these dead-charges will be found in the judicious use of profits to meet the ever-growing demand. The practice of transferring gas profits to the relief of rates, so much in favour in some municipal undertakings, cannot be called sound finance, since it perpetuates municipal indebtedness, while the need for paying interest on unnecessary loans constitutes a tax on the price of gas. If the public supply of gas is to take the important position for which it is so suited as an ideal fuel, and so benefit our town communities, it is imperative that the charges for capital (whether under the control of a municipality or a company) should be kept as low as possible. Taking the moderate amount of 4½d., the sum which suffices to pay capital charges in the city in which we are assembled, and assuming that all other charges are as low as good management and prudence will allow, it may be estimated that the average selling price cannot (with our present methods of manufacture), under the most favourable circumstances yet experienced, fall below 2s.

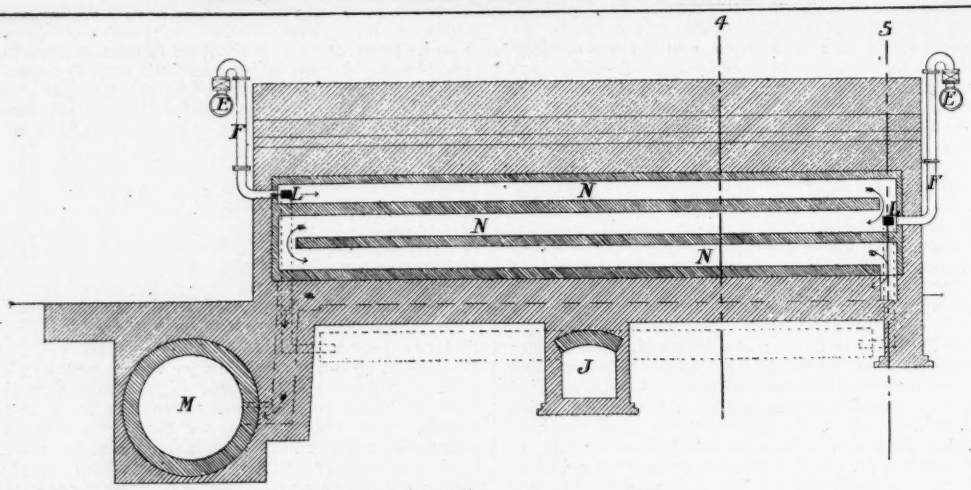
At a much higher price it is by far the cheapest agent for obtaining artificial illumination. For moderate sized power plants, it is cheaper than steam or electricity; for cooking, it is both cheap and convenient; for house warming, although convenient and clean, the price of 2s. per 1000 cubic feet would prohibit its general adoption; for large power stations, to compete with triple-expansion steam-engines or gas-engines with producer gas, the price must not exceed 1s. 6d. per 1000 cubic feet.

What, then, are the chances of making and selling gas profitably at the latter figure? In considering this question, my thoughts at once reverted to the paper read by our esteemed Vice-President (Mr. Charles Hunt) before the Institution of Gas Engineers in 1896, entitled, "Notes on Residuals," wherein he described, with much clearness, the construction and working of modern retort coke-ovens. The results of tests made under Mr. Hunt's supervision, and recorded in the paper, are most encouraging from a gas-maker's point of view, being practically the same as those obtained in ordinary retorts. At that time the greatest objection to the use of these ovens for gas-works purposes was the method of heating, which absorbed about 70 per cent. of the gas given off during distillation, after having been denuded of its oils and benzols.

In Halifax, Nova Scotia, an attempt has been made to substitute Mond gas as the heating agent; but I understand the results have not been satisfactory, probably owing to the construction of the oven not having been adapted to the use of a much weaker gas.

In Boston, Mass., the plan is being tried of collecting the heavier gas from the early part of the distillation and using this for distribution to the town, while the lighter and weaker gas is used for heating the ovens. The output of gas per oven in this case would be very much reduced as compared with a plant heated from an independent source, as in the Halifax scheme.

There is another plan which I think would overcome the difficulty—that is, to use blue water gas made by the Dellwik generator as the heating agent. The flame temperature of water gas is high as compared with either coal gas or Mond gas; its calorific value would be about half that of the lean coal gas, but nearly twice that of Mond gas. The quantity of air required per cubic foot for

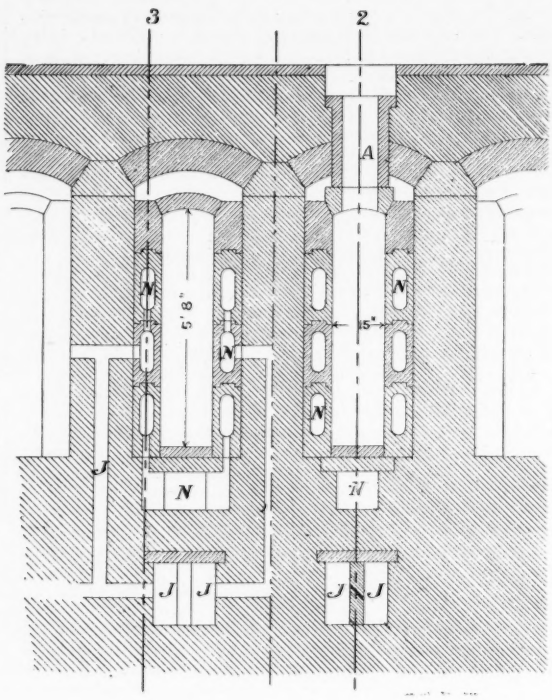


its complete combustion is 2·13 cubic feet, as against 6·37 for coal gas. The water gas would be delivered to the ovens in mains carried on the front of the brickwork, both on the charging and discharging sides, as is now done with the lean coal gas used for heating. The whole of the gas given off in distillation would be collected in a foul main, using only one ascension-pipe per oven, and it would be treated just as our gas is now after leaving the retort-house. The advantage of this system from a labour-saving point of view will be understood on reference to fig. 6, which shows the Semet-Solvay ovens (for which Mr. J. H. Darby, of Brymbo, is the Engineer) as they might be used on a gas-works.

A charge of 4 tons of coal is fed into the oven from the hopper-trucks running on rails; it is then levelled with rakes, the doors are luted and closed, and the distillation proceeds. At the end of twenty-four hours, the doors are opened and the coke (weighing about 55 cwt.) is thrust out by the ram, worked with steam or electric power; the operation of discharging occupying only two minutes. The discharging floor is laid with a slope towards the boats or trucks used for the removal of the coke, so that labour in all the operations is reduced to a minimum.

An installation of retort-ovens to carbonize 200 tons per twenty-four hours, with charging and discharging hearths, where space is not restricted, would cover an area 100 feet by 250 feet. The capital outlay on a bench, complete with coke-ram, &c., would be about the same for equal capacity as a bench of retorts with regenerator furnaces and machinery. The cost for repairs will be less—probably not more than half that for retort-settings.

The primary object in designing these ovens was to produce a dense hard coke of the same value to the metallurgist as that produced in the beehive oven, without the loss of volatile products which accompanies the latter. That this has been attained has been demonstrated by the large demand, and by the price obtained for it. At the present time something like 13 million tons of coal are carbonized annually in beehive ovens; and it is probable that in a few years these will be replaced by recovery ovens. The



A.—Charging holes.
B.—Gas outlet.
C.—Throttle valve.
D.—Receiving and foul main.
E.—Water gas distributing main.
F.—Gas supply pipes.
H.—Electrically driven ram for pushing out coke.
J.—Air-heating flues.
K.—Damper for regulating draught.
L.—Heated air nostrils.
M.—Chimney flue.
N.—Combustion flues.
O.—Hopper waggons for charging ovens with coal.

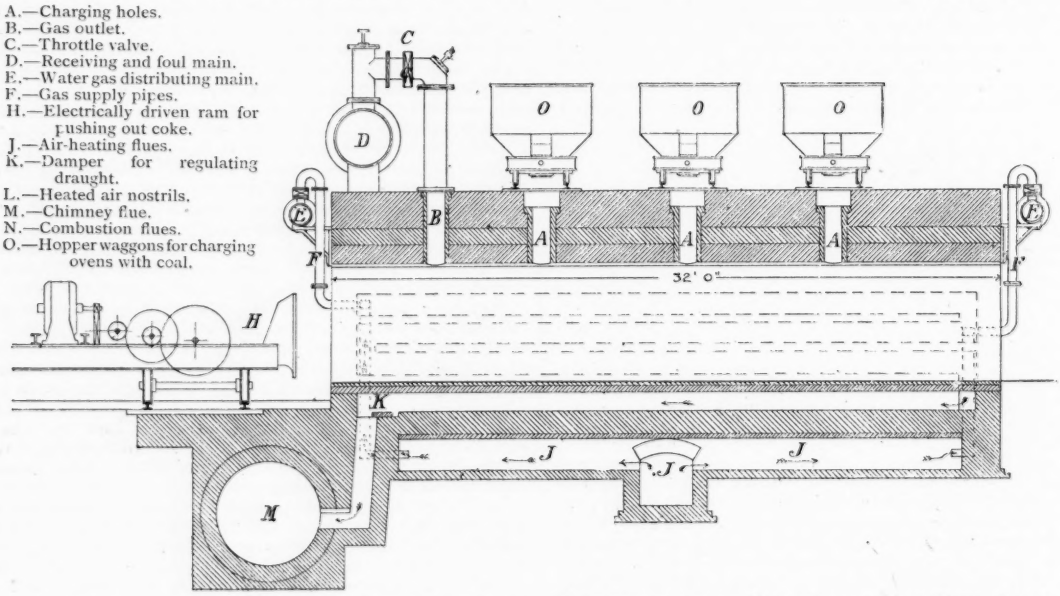


FIG. 6.—APPLICATION OF MODERN COKE-OVENS TO THE MANUFACTURING OF ILLUMINATING AND FUEL GAS.

question of greatest moment to us, as gas, coke, tar, and ammonia producers, is whether the installation of these ovens shall be at collieries or at gas-works. If at the former, we shall experience formidable competition in disposing of our products, and about 130,000 million cubic feet of gas per annum, specially suited for wide distribution and domestic and manufacturing consumption, will be used, where an inferior gas less suited for wide distribution would be equally serviceable.

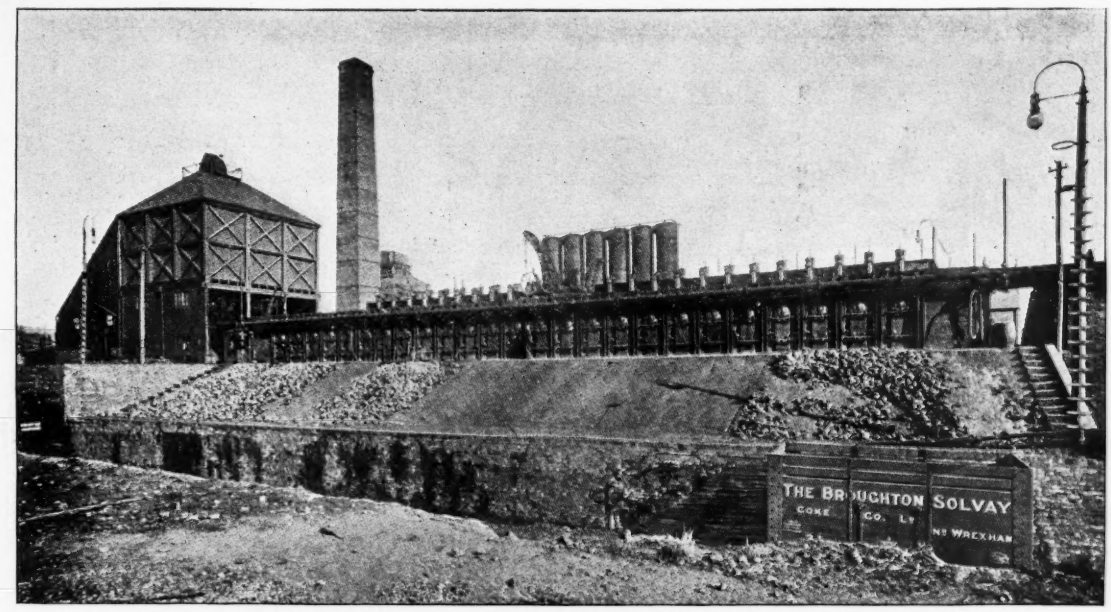


FIG. 7.—SEMET-SOLVAY OVENS, DISCHARGE SIDE, BROUGHTON SOLVAY COKE COMPANY, WREXHAM.

The following figures will enable us to judge of the advantages of using this system for producing illuminating and fuel gas:—

Approximate Cost per Ton of Coal for Coal Gas Delivered into the Holder when Made in Retort Coke-Ovens.

	s.	d.	s.	d.
One ton of washed coal delivered to elevator of oven-bench	17	0·00		
14,500 cubic feet of water gas for heating ovens, at 3¼d. per 1000 feet	4	3·00		
Purification	0	5·75		
Salaries	0	3·50		
Wages	1	0·00		
Repairs and maintenance	1	2·05		
Sundries	0	1·70		
			24	4
Less residuals—				
Coke, 13¾ cwt., at 1s. 3d.	17	2		
Ammonia	1	6		
Tar	1	0		
			19	8
Cost per ton			4	8

Assuming a sale of 10,000 cubic feet per ton, the following might be taken as a fair estimate of the average cost to the consumer. Large consumers for power or fuel purposes might be charged at 1s. per 1000 cubic feet, rising to 1s. 6d., according to the quantity used.

Cost per Thousand Cubic Feet Sold.

	d.
Manufacture	5·60
Distribution	2·00
Rents, rates, and taxes	1·34
Management	1·00
Law charges, bad debts, &c.	0·06
Capital charges	6·00
Average cost to consumer	16·00

If these figures correctly represent the possibilities of the future, we may be assured that our industry is capable of very great development. Manufacturers would certainly appreciate such a supply of high-grade gas for its cheap motive power and high-flame temperature, and, at this price the objection now urged by the householder against its free use as fuel would be entirely removed.

Let us now glance briefly at the apparatus available to the consumer, and the best methods of applying it. Our thoughts at once flow in the direction of that wonderful light developer, the incandescent burner and mantle; but the day is by no means past when we can afford to despise the simple flat-flame burner. What a simple and yet what a libellous bit of apparatus it may be, capable of making or of marring the reputation, not only of the gas, but of the gas engineer. If we could only take entire control of the consumers' burners, and charge the expense on the gas, what brilliant results we could give in place of the dismal and unsatisfactory lighting too often obtained. When we think for a moment that frequently less than one candle per cubic foot is obtained in place of three with a good flat-flame, and about fifteen candles per foot on the average with the incandescent burner, the anomaly is certainly great.

And what shall we say about the incandescent system, capable of increasing the lighting value of the gas from five to seven times? Is it appreciated as its great merit deserves? I question if this is so. Again, it is a question of intelligent attention. The consumer who adapts his fittings to the new system, and gives a reasonable amount of attention to the burners, obtains brilliant lighting at a fraction of the cost at which it could be obtained from our competitors, the electricians. If the consumer cannot give the attention required, he ought to see that it is in his own interest to have a periodical inspection and overhauling; and the improved results will more than repay the small outlay.

There is still room for improvement in the burners. The "C" type especially requires modifying to prevent the dust particles induced with the air supply from being carbonized on the mesh of the burner. This defect is frequently responsible for a great falling off in the lighting value obtained. In some burners purchased direct from Germany this is not so apparent; and it is due to the use of a perforated disc below the wire mesh. The efforts of the burner maker should also be directed to rendering them noiseless. The noise appears to be characteristic of the newer type of injector burner with a central gas-opening. The low price at which mantles can now be purchased is likely to increase the popularity of this system of lighting; but it is important that quality should not suffer—durability without rapid depreciation in light-giving power are points appreciated by the average consumer. These are only small drawbacks, incident to the introduction of an entirely new system, and are as nothing in importance compared with the benefits conferred by this wonderful invention. It is now possible to light a moderate-sized room with one burner suspended on an unobtrusive pendant, where a ponderous chandelier, with three or four burners, did indifferent duty previously. The old complaint of a stuffy atmosphere and undue heating has thus been overcome.

In the lighting of streets, the improvement has also been very marked. The old lantern, throwing deep shadows with the 4 feet per hour flat flame, and giving a light of about 10 candles lengthwise of the street, is rapidly being replaced by the shadowless lantern, giving a light of 60 candles in every direction—thereby increasing the total lighting effect in the street by about 400 per cent. One important feature in favour of street lighting by this system as compared with electric arcs has been appreciated where both systems are in use—viz., the absence of dark places midway between the lights, and the frequent spacing, where gas is used, ensuring good lighting where the streets intersect.

The introduction of brilliantly lighted tramcars in many towns has created an imperative demand for well-lighted streets. As the retina of the passengers' eyes cannot be expected to make an immediate adjustment, and confusion is likely to occur where the passengers alight into streets insufficiently illuminated, it is impossible to set any limits to the demand for light. Certain it is that, without the new system, we could not have kept pace with our rivals. We may therefore congratulate ourselves that we have now the means ready to hand, and are able to retain a fair share of our original business.

While the best incentive to the general adoption of gas for cooking and heating is a reduction in cost, the need for simplifying the acquirement of the stoves or appliances is likely to remain for some time. There is really no hardship imposed on the consumer by a charge for stove-rent; but it is probably a method of charging which, in many cases, hinders the adoption of stoves. If a cooking stove was a permanent fixture, included in the house rental, the consumer would not feel the cost; but he would undoubtedly pay for the extra convenience provided. The objectionable charge for stove-rent may be avoided, as in the case of prepayment cookers, by covering the interest on the outlay in the price charged for the gas. This plan has all the appearance of "free stoves," and is very popular where it has

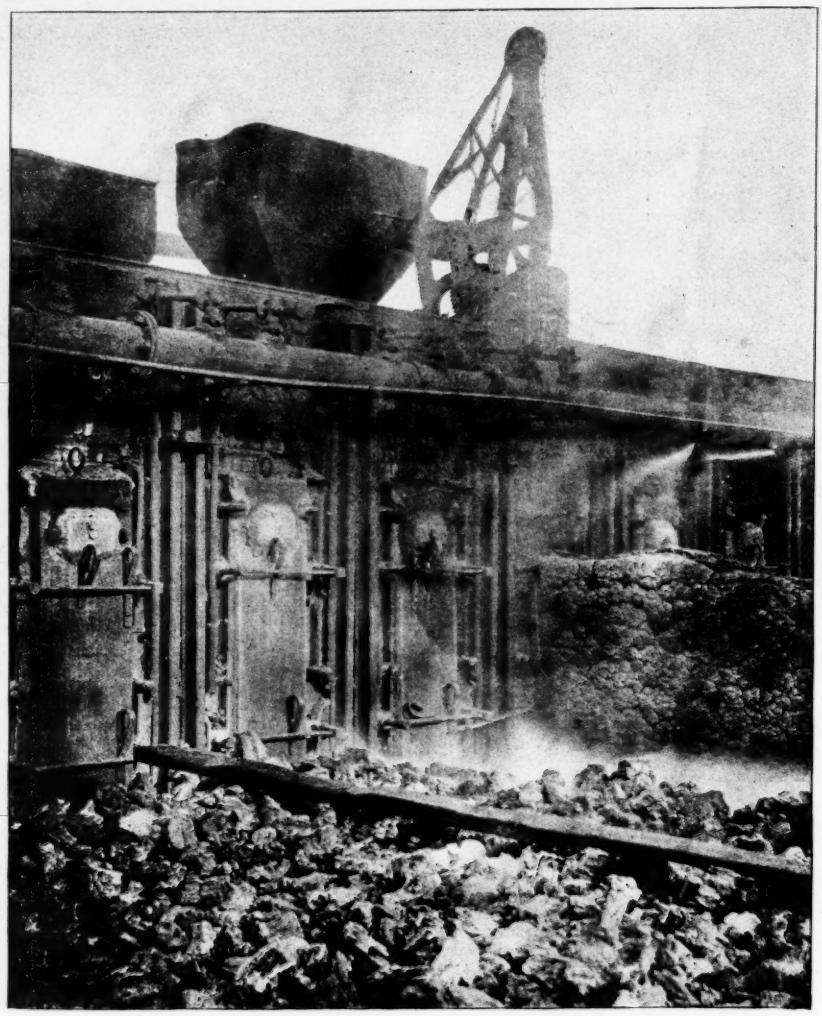


FIG. 8.—BATCH OF COKE IN PROCESS OF BEING PUSHED OUT OF SEMET-SOLVAY OVENS.

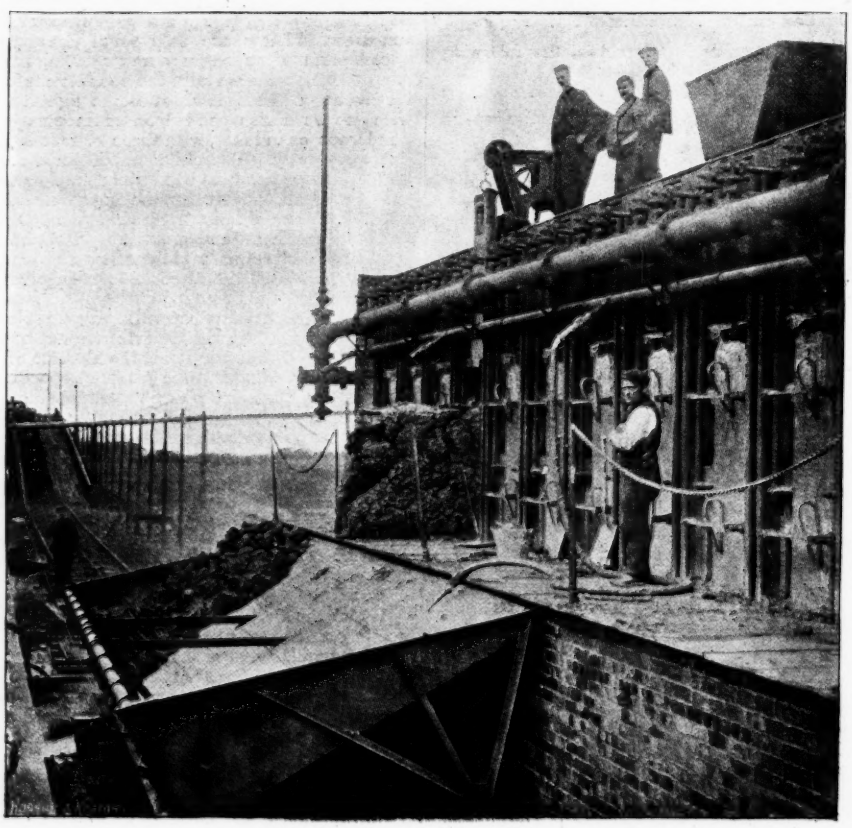


FIG. 9.—PATENT COKE CAR.

been tried. I believe the town of St. Helens was the first to let out stoves free of rent; and the figures as to stoves in use are, therefore, of some interest. I am informed that on March 31 last, the following numbers of stoves were in use: Cookers 2011, gas-fires 1271, grillers 593. The numbers of stoves fixed during last year were: Cookers 737, gas-fires 313, grillers 362. Judging from the relative number fixed in one year to the total number, we shall conclude that the public appreciation of the system is increasing. The number of houses in the borough is about 16,000; and from the above figures it would appear that in a few years' time every house will be fitted with some gas cooking or heating appliance.

In West Bromwich, where 5000 prepayment meters are in use, the grillers sent out with these meters are very popular—some 4000 having been fixed. For ordinary consumers the hire-purchase system has been adhered to; and though the system has the merit of being safe, it would be untrue to say that it is a popular method of introducing cooking stoves. The number fixed last year was 62, and the previous twelve months 33. The total number in use is 229.

We still suffer from the lack of provisions in architects' specifications and in the plans approved by property owners for either gas cookers or gas heaters. In the past there has been some excuse for this; but now, so far as the cooker is concerned, it should be recognized as a household necessity, and provision made for supply and ventilation when houses are being built. The design, substantial construction, and general efficiency of the cooker, as it is now turned out by the leading makers, is very satisfactory. This cannot, unfortunately, be said of many gas-fires; and we are bound to admit that the public prejudice against this method of house warming is not likely to be overcome for some time. Comparative costliness of the fuel, want of artistic design in the stove, and an uncertainty as to the heating effect to be obtained, have combined to prevent gas from being relied upon in the past; and the "JOURNAL OF GAS LIGHTING," in some pithy remarks under the title "For the New Year," concludes that it can only be described at the present time as a makeshift. That this is its final position, we cannot believe. From a public health point of view, and no less for the relief of the housewife, it is very desirable that gas heating should be made perfectly satisfactory. We have now had sufficient experience to justify us in believing that this will be done; but in the meantime we can hasten the confidence of the public by an appreciation of the consumers' requirements—giving attention to detail in fixing, and recommending none but satisfactory apparatus constructed on scientific principles.

The time seems opportune for a conference between gas engineers, stove-makers, and architects; and an effort should be made to come to an understanding upon what lines the new system can be most effectively carried out. The Glasgow International Exhibition should present an opportunity for such a conference; and for a practical demonstration of the artistic merit attained in the design of fires, and also of the heating efficiency. For exact information as to the capabilities of gas as a fuel our industry is deeply indebted to Mr. Thomas Fletcher, of Warrington. In a recent letter from his pen to the "JOURNAL OF GAS LIGHTING" (Vol. LXXVI., p. 1403) there is much information worth noting for future use.

For domestic purposes alone it is estimated that 35 million tons of coal are used per annum; and by comparing the quantity used per head of population in other countries with our own, we find our wasteful methods are responsible for about 20 million tons. The position is one clearly capable of improvement.

We may view with satisfaction the advent of the Westinghouse Company as gas-engine makers in this country. In addition to the benefits which will follow competition with so enterprising a firm, the design of the Westinghouse engine promises to overcome some objections which have hitherto stood in the way of the gas-motor for the generation of electricity. The limit as to power seems to have been set back almost indefinitely by the same firm. Some large engines have recently been made by other firms in this country, both for use with blast-furnace gas and Mond gas. The amount of interest in the subject of gas-engines and the supply of cheap gas was recently demonstrated by the large and distinguished audience which gathered to hear and discuss the paper read by Mr. H. A. Humphrey at the Institution of Mechanical Engineers.

Hitherto our interest as coal gas makers has been limited to engines of moderate power. Are we to have no hand, or take no part, in the larger movement? If 600 B.T.U. fuel gas can be supplied in the larger towns on the lines I have suggested, we may yet secure a full share of this new business. In any case the gas-engine consumer is worth cultivating, with a view to making the gas-mains more remunerative; and with the high-class and economical engines now on the market, there should be no difficulty in displacing wasteful steam-engines for small or moderate power.

I have thus, in an inadequate fashion, touched on some aspects of gas supply, and on some of the possibilities of the future. You will probably be disappointed that I have not been content to deal with actual facts, confining my remarks to the older phases of the gas-maker's duty. I give every gas manager credit for knowing how to give a steady and constant supply of gas, and sufficient is known (and I am sure we are all endeavouring to put into practice the best known theories) to enable us to do this with economy, giving satisfaction to proprietors and consumers.

To conclude our outlook on the situation, we are conscious of the rapid advances in the generation and application of electricity. The day-load, so much desired in the early days of its introduction, has been found in providing rapid transit on tram roads. No one questions the peculiar suitability of electricity for this work, or the benefits conferred on the public, or the effect the large output of units will have upon works costs. Electricity will be sold at much lower prices than was at one time anticipated; and we are sure to witness a number of our consumers either wholly or in part changing over to the new light. Even so, the demand for gas will go on.

We are also rapidly finding our day-load. The effect of using gas for cooking is to multiply the thousands burned by three. When the gas-fire has taken its proper place, and is more widely used, the multiplier will be a much larger figure. Nor is it at all unlikely that the gas-engine may yet become the favourite for the generation of electricity. We have, at all events, some grounds for thinking this may be so; and in the meantime it is somewhat of an anomaly to boast too much of the hygienic properties of the electric light while the chimney at the generating station pours out a stream of black smoke—a characteristic feature of some modern towns.

The evil effects of atmospheric pollution by black smoke are vividly impressed by a comparison of Continental cities with our own; and the attention of the British public is now being directed by able men to the urgent need for improvement. This matter was very ably dealt with by Mr. George Beilby in an address to the Society of Chemical Industry in 1899; also by Dr. Cohen, of the Yorkshire College, in a paper before the Chemical Section of the British Association last summer. Both these gentlemen advocate the use of gas in place of coal for domestic purposes; for the domestic hearth is acknowledged to be a great sinner, and the most difficult to bring under supervision or reform. To us they look for the remedy. Great things are yet possible; therefore, for our industry, there is a land of promise if we have the power to arise and possess it.

There is room, then, in our ranks for the young, eager, virile men who may find in gas management and engineering a congenial sphere, and such remuneration, we will hope, as will prevent them in later life regretting the choice made in youth. It has been lately questioned, by an authority given to looking below the surface, if such men are coming forward; and no doubt the question has been answered in different ways. The young aspirant of shallow disposition may resent the question being raised; the older and more thoughtful may have some misgivings, and at least do not object to the query being put, for it may make us resolve afresh to be worthy of the best who have gone before us. May we be worthy also of the wider conception that we are allied in aims and work to those civil engineers whose work, in Mr. Tredgold's words, "is limited only by the progress of science, its scope and utility will be increased with every discovery in philosophy, and its resources with every invention in mechanical or chemical art, since its bounds are unlimited, and equally so must be the researches of its professors!"

The gas engineer and manager with this ideal will probably attract to his assistance young men of like mind, who, in their turn, will bring no discredit to the honourable profession they have chosen.

At the close of the address,

Mr. J. FERGUSON BELL (Derby) moved a hearty vote of thanks to the President for his admirable and instructive address. The remarks of the President with reference to Mond gas seemed to be specially appropriate, seeing the interest the general public were taking in it at the present time. Personally, he believed coal gas was most suitable for general distribution, because the Mond gas had only a calorific value of some 148 British thermal units. There might be certain positions in this country where they would, with a number of iron and other works in close proximity, be able to put down a Mond gas plant; but the cost of an installation would, he understood, be very considerable. He was sure the members were all looking with pleasure to the experiments the President was making with the Dellwik water-gas plant at West Bromwich, and he (Mr. Bell) must congratulate him on the results he was obtaining. He knew that a good many managers would like to be so situated that they could put gas into their holders at 10d. per 1000 cubic feet.

Mr. CHARLES HUNT, in seconding the motion, said there was only one feeling among the members, and that was gratification at the excellent address they had had the pleasure of listening to. It contained very much that they could cordially agree with; but, in addition to that, he thought he had seldom listened to an address which contained so much controversial matter, and it made one almost regret that members were debarred from discussing it. He was glad to welcome their President's contribution to the literature upon coke-ovens, or what he should prefer to term carbonizing in bulk. He (Mr. Hunt) had not ceased to regard this matter as one of considerable importance; and he felt confident that some of them at any rate would live to see the experiment tried. He did not go quite so far as the President in assuming that it was capable of universal application; or, even if capable of universal application (he meant universal with reference to the coal-gas industry), that it would do more than instigate that competition which was already experienced in the sale of their residuals—for this reason, that it could only be applied in substitution for the manufacture of oven coke in the neighbourhood of large towns

where oven coke was used. The bulk of such coke, which was used for iron making, must still be produced at the collieries; but he did think there were the germs in it of a successful system of carbonizing as applicable to the manufacture of illuminating gas.

The motion was carried with applause.

The PRESIDENT thanked the members very heartily for the cordial manner in which they had received the address. He must say he had taken a little trouble over its preparation, and was glad it had commended itself to the members. He was sure they all welcomed the few words Mr. Hunt had added, about the topic which was rather a favourite of his.

DISTRICT ASSOCIATION REPORTS.

The members next endorsed a recommendation of the Committee that the annual volume of "Reports of the District Associations" should be distributed among the members who were not in arrear with their subscriptions.

Mr. T. BERRIDGE (Leamington) then read the following paper, entitled—

THE TRAINING OF A GAS ENGINEER.

The question of a more systematic and efficient training for those engaged in the higher branches of gas engineering is an extremely pressing question. It is not a new one. For months past our professional journals have contained articles and letters bearing on the subject—all regretting the present state of affairs, but, generally speaking, affording little help as to what to do and how it is to be done. It is clear that there exists a keen interest in the question, and that it is ripe for some sort of action by those having the interests of the profession at heart. If we ask what is being done in this country for the education of those intending to follow gas manufacture and engineering, we find, strange to relate, that, outside the gas-works, there only exist in the larger towns a few courses of instruction in gas manufacture in technical colleges—usually in connection with the City and Guilds of London Institute. These courses, generally held in the evening, though undoubtedly excellent in some cases, only bring into strong relief the general lack of means of systematic education. As to the training in the works themselves, much remains to be done. In too many cases pupils are *allowed* to learn—if they can. They have the run of the works; but as to any systematic course which they are compelled and assisted to follow, this is, I venture to believe, the exception rather than the rule.

It may not be unreasonably asked why this state of affairs has continued to exist for so long; and the answer would seem to be that, in the more primitive stages of an industry, the need for systematic training is by no means obvious. Further, we are only now beginning to realize in this country that, if we are to hold our own, we must educate our young engineers more thoroughly. We must listen with an intelligent ear to what Science has to teach; and we must aim at replacing rule-of-thumb by scientific methods. If we gas engineers have failed to recognize this truth, we have erred in good company. We may—not unnaturally—have lagged somewhat; for the gas industry has, almost of necessity, been something of a monopoly. Had it been otherwise, the fierceness of commercial competition would, in many cases, have compelled gaslight companies long ago to adopt more economical and scientific methods; and this would have involved the securing of highly trained engineers. It is unnecessary to remark that this would also involve the payment of far higher salaries than is the rule at the present time. But the need for the more thorough and specialized training to which I have referred is largely of recent growth, and is due to the rapid development of the industry.

We have seen great changes, both in the production and utilization of gas for illuminating and heating purposes as well as for obtaining power. We have seen useless bye-products recognized as valuable sources of a vast number of useful substances; and there is no reason to suppose that the end has yet been reached. Everything points to further discoveries and developments; and the attitude of an enlightened engineer is not only to be prepared to accept and utilize these, but to aid in bringing them about. Indeed, I am certain that no one is more convinced of the value of scientific training and knowledge than those engaged in the industry; and I venture to suggest that the time has arrived when we might wisely take some steps to ensure that those seeking to enter the profession have received a suitable education, and that they shall continue to prosecute their studies along well-considered and enlightened lines.

We move somewhat slowly in this country; and it is the usual plan, in a case such as this, to inquire what foreign nations are doing. We learn much in this way, particularly in regard to what they have accomplished. But in regard to education and professional training we are not much helped, as the social and commercial conditions vary so widely from those in England. It is far better that we should initiate some tentative scheme, and see how it works, than attempt to acclimatise a foreign method. You will have seen in our journals some account of the educationa work of the Trustees of the Gas Educational Fund connected with the American Gaslight Association. Here some attempt has been made at education by correspondence. I should be sorry to disparage this or any earnest attempt having for its object the more complete education of our young engineers; but I should more strongly regret the acceptance of the notion that such a scheme was anything of the nature of a solution of the problem.

It will be seen that this scheme does little more than provide a test—although a good test—of the knowledge of the pupil. What we want to lay down is a course which may, and should, be followed by the young student of gas engineering, and the establishment of a sound test of his knowledge and ability. It would not be difficult to draw up a scheme under which a diploma should be granted by our professional bodies; and I propose to again refer to this aspect of the subject. But the more pressing need is to secure that facilities should exist for training, and that some sort of understanding should be arrived at as to the best course of study the embryo gas engineer should follow.

I should like, at the very outset, to guard against a possible misunderstanding. I do not think that the technical school can ever replace the works; and I do not advocate any replacement of experience in works by technical school courses. The proper duty of the technical school is to supplement, not supplant, the works. The training of an engineer is to be had among the actual surroundings of his work, and not in a toy college workshop—even where it exists. Such a workshop has its own special value; but it nevertheless remains a fact that the best practical training is secured among the surroundings of the actual industry. At the same time, the technical school is an essential adjunct. If theory is useless without practice, the practical man is certainly an indifferent one without some knowledge of theory. He is not a truly practical man who lacks the wide knowledge, the method of thought, and the resourcefulness which a knowledge of science only can supply.

In this connection, I should like to quote from an address delivered by Professor Perry, as President of the Institution of Electrical Engineers—an address remarkable for its charming freedom and practical wisdom, and one which every engineer should read for himself.* Speaking of the electrical engineer (and his remarks would apply with equal truth to the gas engineer), he says he "must have such a good mental grasp of the general scientific principles underlying his work, that he is able to improve existing things and ways of using these things. It has become the custom to call this theory; and I suppose I must follow the custom. I should prefer to call it science or knowledge. Do you remember Huxley's definition of science? 'Science,' he said 'is organized common sense;' and this is really what I mean. Well, calling it theory, the man who is permeated by theory, whose theory is so much a part of his mental machinery that it is always ready for practical application to any problem, he is the real engineer. But you must not mistake me in this matter. Eighty per cent. of the men who pass examinations in mathematics, mechanics, and electricity have very little of this theory. Fifty per cent. of the writers of letters in the engineering journals, in which mathematical expressions occur, have almost nothing of this theory in their possession. It is unknown to foolish men. Books alone, lectures alone, experiments alone, workshop experience alone cannot teach this theory. The acumen of a Q.C. may actually prevent a man from acquiring it. A man may have much of this theory, although he may never have listened to lectures, although he may dislike the sight of a mathematical expression. I have known men who might be called illiterate to possess much theory."

I think we must say that, although a man *may* possess this quality without a scientific training, and although a man might receive a scientific training and yet not possess it, we have no surer means of discovering and cultivating it than that of a soundly planned education in physical science.

First among the difficulties that confront us in considering the question of the training of a gas engineer, is that of the general education which precedes the specialized training to which this paper especially refers. It is very undesirable that specialization should commence too early. It does not seem desirable that any consideration should be given before his fifteenth or sixteenth year to the fact that the youth is to become a gas engineer. But consideration should be given to the fact that he is to live a practical life. We desire that his teachers should, in the words of Milton, recognize that—

> "Not to know at large of things remote from use
> Obscure and subtle, but to learn that
> Which before us lies in daily life
> Is the prime wisdom."

To be plain, we do not see the purpose, in the education of such a youth, of the devotion of his time to a study of Greek or Latin. No doubt a knowledge of these dead languages would be of some value in regard to his general culture—supposing he learnt them thoroughly; but this knowledge would probably be acquired at the cost of other subjects of infinitely greater importance in regard to his life-work; and probably these subjects are not inferior to Greek and Latin as a means of mental and moral training. I do not wish it to be thought that I advocate a narrow education; but I do think it should be clear that the course which might be the best for the literary or leisured man would certainly not be so for the future engineer. The point has a very practical bearing, because in most secondary schools there are modern as well as classical sides; and there can be little doubt as to which should be followed in this case. A knowledge of French and German cannot be greatly inferior to Latin and Greek as a means of culture; and they are certainly of enormously greater practical value.

My attention has been called to a scheme for organized schools of science for day students connected with the South Kensington

* "Journal of the Institution of Electrical Engineers." Vol. XXX., p. 43.

branch of the Board of Education. There are already something like 200 of these schools in the country; and they provide for youths over the age of 12 a modern course of instruction in science and literary subjects. One modern language at least must be taken; and instruction must be given in mathematics, practical geometry, chemistry, physics, and freehand drawing. Manual work in iron or wood forms part of the course; and chemistry and physics must be taught in properly equipped laboratories. This course of work, which is intended to be spread over three years, forms an admirable preparation for the more specialized training which is to follow. An intelligent youth, on passing through such a course, will leave school with the possession of a sound knowledge of the elements of physics and chemistry, with a knowledge of drawing, of the use of tools, and the properties of materials, and, let us hope, a conviction that he has not yet learnt all that is worth knowing. He will have all the advantages which follow from having performed experiments with his own hands, will have acquired some considerable amount of manual dexterity, and, we hope, of power of thinking clearly. Without such a training as this, it is extremely difficult for a youth to take up successfully the study of the special subjects desirable in a special training. We know it has been done; but the difficulties are great.

Two courses are open to the youth leaving a school such as I have described. If he is intended for the higher walks of the profession, and his means permit it, he may pass on to the university or university college, and continue his study of science. In most cases, however, on leaving the school, at (say) the age of sixteeen, the youth may in some capacity pass into the gas-works. Here his special training will commence. It is almost unnecessary to say that his training in the works will depend upon the conditions of his engagement, and also, in no small measure, upon the manager. In any case, however, it will be desirable that he should continue his study in evening classes. Thanks to the Science and Art Department, the City and Guilds of London Institute, and the powers conferred upon County Councils by the Technical and Local Taxation Acts, nearly all towns of any size possess technical schools at which a young man can continue his scientific education; and, as the demand for such instruction increases—and increase it must—so will the efficiency of this instruction develop.

It may seem a little hard that a youth who has been at work during the day should be expected to continue his study in the evening. But it is not likely that this will injure him, and certainly will not be so harmful as the aimless way in which so many of our young men spend their evenings. In any case, if the youth has any ambition, any enthusiasm for the calling he has chosen, he will gladly take this opportunity of educating himself. The problems he will constantly meet in his daily work will stimulate his desire to learn more. It is certain that we cannot educate a youth unless he is of the mind to receive instruction; and in many cases one observes an entire absence of stimulus. This stimulus is supplied as soon as the youth begins the serious business of life; and if there is any good in him, he is glad enough to get help in evening science classes. It is by the aid of experience in works, combined with the somewhat more theoretical work of a technical school, that the best results may be attained.

Let us take the case of a youth then who has passed through the school of science course, or a similar one. He will be armed with a sound elementary knowledge of mathematics, physics, and chemistry, and may begin to specialize in evening classes while following his avocation. What subjects should he study? It is certainly not enough that he should attend a class on gas manufacture for one evening a week; nor can we expect him to give up all his evenings. But it is not too much to expect him to attend a technical school for (say) two evenings a week, and supplement this by private study at other times.

A gas manager has need of wide, as well as special, knowledge. He must understand the economical production of steam; and his varied duties demand a knowledge of mechanics. He should be familiar with drawing office work; and he should be a good chemist. In particular, he should have a knowledge of the chemistry of organic compounds. I do not suggest that the usual duties of a gas manager require any such knowledge; but I am now thinking of the future.

With these considerations in view, I have ventured to draw up a course of work for students of gas manufacture and engineering, to be followed in evening classes at technical schools. The course is intended to be spread over four years. I may at once say that it is only a contribution to a difficult question, and does not claim to be a full or final solution. Of one thing I am sure—namely, that a student who has passed through such a course in a good technical school will be prepared for any sort of problem that may occur in the course of his work; and there are few towns of any size where a student cannot obtain instruction in such subjects.

Suggested Course of Work in Evening Classes for Students of Gas Engineering who have received a Preliminary Education in General Elementary Science.

First Year—
- Mathematics.
- Machine Construction and Drawing.
- Organic Chemistry (Theoretical and Practical).

Second Year—
- Applied Mechanics.
- Building Construction.
- Organic Chemistry (Theoretical and Practical).

Third Year—
- Steam.
- Gas Manufacture (Ordinary Grade Syllabus).
- Building Construction.

Fourth Year—
- Steam.
- Gas Manufacture (Honours Grade Syllabus).
- Electrical Engineering.

This suggested course calls for one or two observations. In regard to mathematics of the first-year course, I would suggest that it should be of a practical, rather than an academic, character. It is more important that the student should employ mathematics as a tool than as a means of mental gymnastics—more important that he should be an expert in the use of the slide-rule and squared paper than conversant with the elements of Euclid. It is a promising feature that what may be called a new subject has been introduced into the directory of the secondary branch of the Board of Education. This subject is called 'Practical Mathematics; and is just what the young engineer wants. It is now taught in very many technical schools; and surely should be taught in all. The object of this subject may be studied in an interesting pamphlet, obtainable through Messrs. Eyre and Spottiswoode for 6d.; and is called "Practical Mathematics—Summary of Six Lectures delivered to Working Men by Professor John Perry."

Another point is the introduction of electrical engineering. This seems to me to be a very important point. There are many places where gas manufacture and the production of electrical current for illumination and power are carried on together, and under the same management; and in small centres there is no reason why it should not be so. The well-trained gas engineer should be capable of taking charge of a small central-lighting station. Even where this is not the case, the use of electrical devices has become important in almost every industry, and will assuredly continue to increase in gas-works. So that a knowledge of electricity should be regarded as an essential part of the education of the gas engineer.

It is not to be supposed that the course I have suggested will be suitable under other circumstances than those I have laid down. Thus, if the student should not have received the preliminary scientific training, he would not be prepared to take the course exactly as laid down, but should devote himself to the study of mathematics and inorganic chemistry; and for him the course of study will be of necessity prolonged.

I should be glad for this suggested course to be criticized; but I hope that in this, or some other form, it may serve as a basis for a scheme which might be recommended by an authoritative body representing the profession. I believe I am only expressing a common sentiment when I suggest that the time has arrived when we should take steps to ensure that those entering the profession should have had a suitable scientific and professional training—both of which should be insisted upon. Whether recognition should in future depend upon the issue of a diploma, or consist in membership, is a question for discussion; but it will, I think, be agreed that something ought to be done, at least, to attach some mark of proficiency to the able and successful student. Other professions have adopted this method in one form or another; and it is high time we followed their example. If this paper shall have served no other purpose than that of quickening interest in this important question, I shall feel well satisfied.

I may point out that the full technological certificate in gas manufacture granted by the City and Guilds of London Institute—including, as it does, the passing of certain science examinations under South Kensington—has already a recognized value, which should not be lost sight of. It would be well, I think, that any scheme should be a progressive one, based, so far as possible, upon existing means.

Even with a more perfect training in technical schools, it will still remain a fact that an important, perhaps the most important, part of the young engineer's training will be that in the works. And here arises the important question as to whether large or small works offer the better facilities for training. One important advantage of large works over small is that the students will probably see better plant and appliances; but, on the other hand, owing to the subdivision of work that must take place in all large works, he will probably not get so all-round an experience as in small works. Among other points, it is surely not unnecessary to draw attention to the question of courtesy on the part of our students. If it did not sound mercenary, I might speak of the commercial value of courtesy. But worthier considerations render it desirable that our students should seek to be courteous, not only to those in authority over them and to customers, but also to those working with them—workmen and others. It would help to solve many a difficult question. This, together with the exercise of tact, will go a long way to ensure future success. A director or a corporation committeeman surely has a right to claim an hour, or many hours, polite attention on the part of a manager, when he desires to inspect the working of the plant, or obtain information as to methods and results.

I have previously referred to the scheme of the Trustees of the Gas Educational Fund of the American Gaslight Association—a scheme which was recently explained by Mr. Forstall in a paper read before the International Gas Congress in Paris. This was designed for those filling subordinate positions, and should, I think, be regarded merely as an expedient. At present (or at the time when the paper was read), it only extended to some 100

students under one teacher, who does not see his students and only criticizes answers to questions. This, no doubt, provides a valuable incentive; but I do not think it is a scheme we should imitate in England. There is one important point to which I should like briefly to refer—viz., the establishment of a really good technical library in connection with—shall I say, the Amalgamated Gas Engineers' Societies. I am, of course, aware that the Gas Institute has a library; but to what extent is it used by gas engineers in the Provinces? Such a library, to be of real value to us, must issue books on loan. It is impossible for us to make a journey to London when we desire to look up a technical point in connection with our work.

But when all this has been done, have we taken all the steps possible for raising the profession to the highest state of efficiency? I venture to think not. The education of the gas engineer is never complete; and so long as scientific discovery continues to progress and develop, so long the engineer who ceases to progress remains, not merely at rest, but falls behind. It is difficult for us who have the cares and responsibilities of works upon our shoulders to keep abreast of modern developments; but the papers read at our meetings, and the articles in our engineering journals, are invaluable aids in this respect. I think, nevertheless, that something further might be done. Might we not establish short courses of lectures, of a higher type, by experts on subjects of special interest. I am aware that the financial difficulty will immediately arise. But this should not be insuperable; and it ought to be possible to secure for this purpose some of the money placed at the disposal of County Councils for the purpose of technical education. It is surely a mistake that so large a proportion of this fund should be devoted to elementary technical work, or to work which cannot be said to be technical at all. In any case, it is a grave defect to neglect the coping-stone of the educational structure; and I have little doubt that, with a suitable organization and scheme, County Councils could be persuaded to make grants-in-aid out of the fund referred to.

If any doubt should still be entertained on this subject, I may mention that the National Association of Colliery Managers has, through its local branches, organized and carried out such courses; and these have been assisted financially by County Council Technical Committees. I venture to suggest that it is a question we might well discuss. It is a possible method by which we could avail ourselves locally of the experience of technical experts. It is desirable that we should do so. Surely in few industries does science play so large and so important a part. We are deeply conscious how much we owe to science, and how many questions —momentous questions—remain for solution. Our work bristles with important commercial and scientific problems. Can any one who has studied the rise and rapid development of the gas lighting industry during the last century doubt that further progress must be made?

We are still confronted with the question how to obtain a maximum of illumination with the minimum expenditure of energy. This is the problem with all modes of illumination. Our electrical brethren have made great strides in this direction; and the invention of the Nernst lamp, which is a practical, and seems likely to become a commercial, success, marks a huge advance as an economical converter of electrical energy into light. For ourselves, we can point with satisfaction to the Welsbach mantle and intensified gaslights. But even with these, we (as they) are a long way behind the efficiency of the glow-worm, which, I believe, produces its light more efficiently than any other light-producer. Progress in the past encourages us to hope that we are on the eve of still further advances in this and other directions. In these matters, we cannot afford to neglect the work of scientific men any more than they can afford to neglect ours. The history of the century now closed is full of examples of the beneficent result of the close relationship between pure science and practice. Indeed, a scientific man to be really scientific must be practical; and the practical man must be an indifferent one if he be not scientific. We resemble electrical engineers in so far as our calling is a modern one. The progress of each has been rapid; and the competition has been mutually helpful and stimulating. Both industries have been marked by rapidly succeeding discoveries. It is for us not to wait for these, but to prosecute our inquiries, and endeavour by all the means that are at our disposal, to anticipate them.

In conclusion, allow me to say that I hope these suggestions will be freely criticized. I have offered them under the pressing conviction that the time has arrived for us to make some common effort towards securing for those entering, or about to enter, the profession a better and more scientific training than has been possible in the past. Our position depends upon this. The question is more pressing than it has ever been in the past. Rapid development has made the production and utilization of coal gas a more complicated and scientific process than before; so that it becomes our duty to seek for, and utilize, all that science has to teach, as well as to train and press into our service the highest technical skill available.

One of the first things my respected chief taught me when I started business was "never to put off until to-morrow what could be done to-day." Acting on this advice, the above paper was written, typed—by the way, every student should learn to use the typewriter—and pigeon-holed ready to be sent to Mr. Meiklejohn in due course, before the interesting particulars respecting "Technical Instruction in Gas Making in Germany" appeared in our excellent journals. The Germans are, in educational matters, a long way ahead of us. But we have not got an English Gas Association owning many works; and if we had, I doubt if a school gas-works, on the lines of that instituted at Dessau, would answer in England. I cannot see how a works having an output of 35 million cubic feet can find work for many pupils, or pupils in Germany must be of a different build to those in England. They have twelve at Dessau. At Leamington we make 200 million cubic feet of gas per annum; but I venture to think two pupils, or three at the most, would be as many as one could do justice to. The details of the course for the training of gas managers at the Technical High School at Carlsruhe, and of the advanced course for lighting engineers at the same school, are excellent in theory; but are they practicable in England? What gas manager (not pupil) could afford to spend three years entirely studying. And at the end of the time would he be worth his salt? Would he not be always looking out for theories, or base-lining things instead of watching markets, checking Union aggression, and being what any gas engineer now-a-days must be—a real good business man.

Discussion.

The PRESIDENT said he thought the members would all agree with him that they had had an excellent paper on a subject which was very much "in the air" at the present time. He hoped the question would be well discussed.

Mr. G. HELPS (Nuneaton) generally agreed with the lines Mr. Berridge had laid down in the paper; but there were some things upon which he should like to have a little more explanation. Reference was made in the paper to college classes or workshops where the use of tools was learnt; and he should like to understand whether Mr. Berridge's idea was that these workshops should take the place of apprenticeship in the case of mechanical engineers. Passing through the foundry and the fitting-shops seemed to him (Mr. Helps) to afford the best opportunity for the student who wished to reach the topmost rung of the ladder in the profession. In his suggested course of work for the student, Mr. Berridge did not appear to put mathematics very prominently. He only included it in the first year's work; but he (Mr. Helps) thought there was sufficient value in mathematics for the study to be continued during the whole four years. That was one of the sciences that engineers of the present day did not take anything like the account of they should do; there were really very few engineers who applied mechanics to their every-day work. Mr. Berridge also touched on education by correspondence. He quite agreed with him that education by correspondence could not take the place of contact teaching. The author further asked for expressions of opinion with regard to the formation of a representative body to grant diplomas to those wishing to qualify for the profession. This appeared to him (Mr. Helps) unnecessary if they considered what was already done. There were several degrees of certificates granted by the City and Guilds of London Institute. There was the ordinary grade certificate in gas manufacture, the provisional honours certificate, and the full technological certificate. Certificates such as these were very valuable; but he admitted they did not go all the way that was necessary if a man wished to be considered a thorough gas engineer. In addition to taking the full technological certificate, he would suggest that the student should go in for the examination for entrance as a member of the Institution of Civil Engineers, which covered several subjects not dealt with by the City and Guilds of London Institute. He should think that with such credentials any boy could take his stand in the profession. Speaking of the paper generally, he thought Mr. Berridge had been a little unfortunate in some of the expressions he used. He had, for instance, mixed up the gas engineer with the gas manager. When he (Mr. Helps) first read the paper, he had some doubt in his mind as to what the author quite meant, because all along the line he recognized study for the gas engineer until he came to the final half-a-dozen lines or so, and then he seemed to throw study to the winds as it were, and asked, "What gas manager could afford to spend three years entirely studying? And at the end of the time would he be worth his salt? Would he not be always looking out for theories or base-lining things, instead of watching markets, &c.?" This struck him (Mr. Helps) as being rather unfortunate, because the gas engineering student was not called upon to watch markets, and so on; that being more particularly the gas manager's duty. Of course, some people might say the qualifications of a gas engineer were the same as those of a gas manager; but that he did not admit. He could quite understand that a gas engineer might make an excellent gas manager; but it would not follow that a gas manager would make an excellent gas engineer.

Mr. B. W. SMITH (Walsall), while appreciating the paper very much, said he had had some little experience in teaching and imparting what knowledge he possessed to pupils; but he did not agree with all the lines Mr. Berridge had taken, though no doubt, if they were properly introduced, they would form a fair basis for a gas manager's and even a gas engineer's education. A man must begin at the bottom rung of the ladder before he could aspire to the top; and he believed the paper had been written with this in view. He considered that the gas engineering pupil should have a fair education at school, in the usual routine; but, with regard to foreign languages, these were not absolutely necessary, except for obtaining extracts from foreign papers, which were so often useful to the profession, but which were secured through the medium of their own technical Press. The most essential point in the training of a pupil was that he should be kept on his work, and not left to himself too much. His evenings should be properly

occupied not only by studying two or three nights a week at some technical school, but the gas engineer who was responsible for his proper training should provide him with subjects upon which to prepare a paper. By means of such papers during the whole course of the pupil's training, the engineer would be able to see what progress he was making in his education. If then he found the pupil was not making progress in one particular point, he should consider it his business to keep that point to the front. In his (Mr. Smith's) opinion, this was the crucial test of the efficient training of a pupil.

Mr. J. Ferguson Bell (Derby) remarked that the subject before the members seemed to be one of special interest just now to the gas profession, judging from the number of letters which had appeared in the technical journals; and it was a topic well worthy of discussion. At the present time in this country, there seemed to be a great amount of hostility to education; for if they compared what was done in the matter of education in England with what was done in Germany, it must be admitted that this country was far behind Germany. It was true that in England there were technical schools for foremen and workmen for the higher grades; but he thought that to make them more valuable (and this was a question that should engage the technical schools), they required to be federated to some of the larger manufactories, so that the students could give a certain amount of time in the schools, and the rest of the day in the workshops. A man training for a gas engineer, if he spent a few hours in the workshops was all the better for it, if it was only to learn the use and handling of tools. He disagreed with an incidental remark of Mr. Berridge's that there was not much use in learning Euclid; its study was the finest training one could have. He agreed generally with the course of study proposed in the paper, with one or two exceptions. He (Mr. Bell) would suggest that in the first year the student should take up mathematics, building construction and drawing, and inorganic chemistry (theoretical and practical). In the second year, pure and applied mathematics, building construction, organic chemistry (theoretical and practical). In the third year, instead of having steam, he would suggest applied and theoretical mechanics, gas manufacture (ordinary grade), and building construction; and in the fourth year, steam, gas manufacture (honours grade), physics, and electrical engineering. These, of course, were only suggestions. There was one other matter in the paper which was worthy of the attention of the Midland Association. This was the hint that they might have a series of lectures; and he thought the Association might do something in this way in Birmingham as a centre of a thickly populated district. If the Committee took the matter into consideration, he felt convinced they could arrange for a course of lectures by some of the most eminent engineers.

Mr. Charles Hunt, on the invitation of the President, said he approached this important subject with great diffidence. He was not in accord with the author of the paper, nor was he sure that his views would meet with general support. The paper was entitled "The Education of the Gas Engineer." What was education? It did not merely mean the acquisition of knowledge; but—and perhaps primarily—the training or strengthening of the mind so as to enable it to assimilate knowledge, and apply it correctly to everyday problems. In this connection, he thought the quotation from Professor Perry's address was a very apt one, although he ventured to suggest that it had been somewhat misapplied by the author of the paper. It appeared to him that Professor Perry was impressing upon his hearers the necessary qualification for a successful engineer, who, according to him, should start by being a well-trained man of theory, capable from his training of applying his theoretical knowledge to the solution of practical problems. At the same time, he (Professor Perry) admitted that there were men who, without the advantages of such training, were yet gifted with a natural power of assimilating knowledge and correctly applying it. Nothing, however, ought to be left to chance. At the present time, so-called practical people deprecated time spent on the dead languages, and even, as they had just heard, upon Euclid, &c. But this surely served a useful purpose; and such study might be termed the groundwork of any sound system of education. He did not think that the status of the gas engineering profession was likely to be improved until this was fully recognized. Let them not make the mistake of acting as though what had been good enough for them was good enough for their children. They must advance with the times. To take a lad from school now-a-days at the age of 16, and put him to some occupation in a gas-works, expecting him to acquire during his leisure what he ought to have acquired at school or college, was not giving him a fair chance. He (Mr. Hunt) was very far from decrying the advantages offered by technical schools, nor did he lightly appraise the virtue of self-help. He would not be true to himself if he did so. But he would give the lad as liberal an education as he could afford, feeling that he was making a good investment, and to do so would not be in a hurry to put him to the practical work of life. He had heard it said by younger men than himself that the sooner a lad was put to business the better. This, he thought, was all rubbish; and he held that a lad should have a proper and thorough training in the first place, to enable him to play his part in the battle of life. If it were possible, most lads might with advantage be kept at school or college until 18 or 19 years of age, assuming, of course, that useful work was being done. Then (remarked Mr. Hunt humorously) there was still another point, though he did not suggest this by way of reproach. There was not a word in the paper about cricket. (Laughter.) This raised a laugh; but surely physical exercise played an important part in the development of the mental faculties; and good cricketers generally meant useful men. He was afraid his remarks were somewhat disjointed; and that he was not doing full justice to the subject. But he spoke feelingly, because he happened to have been removed from school at the early age of 15, and he had all his life lamented that he did not have two or three more years. And now when a deliberate proposal was made, as a part of a set scheme of education, that lads should leave school at such a tender age, he felt bound to protest against it. With regard to the suggested lectures on gas manufacture, he was not clear as to the advantages which it was expected would be derived from them. Were they intended to be addressed to gas managers or to youths?

Mr. Berridge: To both.

Mr. Hunt (continuing) said his opinion was that the youths would better occupy their time by pursuing the ordinary course of a scientific education; and he certainly did not know a single professor of the Birmingham University who was capable of instructing gas managers in their particular work. Then as to the earning of certificates of proficiency in gas manufacture by correspondence or otherwise, he thought the members would agree with him that these were scarcely worth the paper they were written upon, unless they proved beyond a doubt the possession of practical knowledge. It was far better for the student to aim at some degree of proficiency in scientific knowledge, either mechanical or chemical. If the former, a course of training in some large workshop would be invaluable to him, and even though he might not set foot in a gas-works until the age of 21 or 22, no time will have been wasted. It had been well observed to him (Mr. Hunt) by an eminent scientist, "It is the late comers who take the prizes." In other words, it was a mistake to begin practical life too early; and the sooner this was recognized and acted upon, the better would it be for the status of the gas profession.

Mr. S. Glover (St. Helens), at the request of the President, supplied information as to the working of the technical school at St. Helens. He said he had it on the authority of a gentleman who conducted some large works there that those students who had the ability and willingness, and who took the trouble to acquire knowledge in the way Mr. Hunt said it should be acquired, by assimilating it, received very great help by the training that was offered to them at the technical schools; and they became very valuable. Whether it was for chemical, mechanical, or electrical engineering, the training received in the use of tools and the proper application of the forces of science shortened the period of their apprenticeship by two or three years. That was the opinion of a gentleman who had observed in his own practice the effect of the training in these schools. He thought the paper and the discussion would do something to remove the fear that was held over their heads that presently we should be receiving into England gas managers "made in Germany," who would be sent over to teach English gas managers how to make gas out of distilled tar, how to make sulphate of ammonia, how to use enrichers, and so on. Speaking of the proposals made in the paper, he said that if facilities could not be provided for the acquisition of knowledge by those who were to follow in the conduct of the great gas concerns of this country, and if they had to wait for the young gentlemen who could afford the time to stay at school until they were 18 or 19, then he thought the profession would suffer for a long time to come. He also referred to the numbers of men who were to be found on gas-works who had had no such opportunities of long periods of schooling or college education, and yet had the power of developing and assimilating knowledge, and would, given the opportunity, make some of the best gas engineers and managers of the future. He commended to the members the vigilant looking out for such men, and the giving to them of the opportunities for improvement. He alluded to Mr. Hunt as a personal contradiction of his own theory; and later in his remarks spoke of the great mistake that some gas engineers made in hawking round their pupils and getting them christened gas managers and engineers at a salary which was only equal to the wages of an ordinary mechanic. There were some positions offered that should be left sternly alone; and they ought to advise their pupils not to touch them. He was glad the suggestion was made in the paper that gas engineers should be trained in some measure in the knowledge of electrical engineering, as not only would it enable them to do what Mr. Berridge referred to, but it would enable them to combat some of the wonderful figures put forward by electrical engineers. In his own experience, he had felt the usefulness of a knowledge of electrical engineering. He believed this would be the inaugural meeting of some step being taken—very likely in Birmingham—for the better training and development of gas engineers and managers—not forgetting the commercial side.

Mr. J. C. Belton (Chester), referring to the progress in the comfort and conveniences of life which were initiated in the brains of Watt, Stephenson, Murdoch, and Welsbach, remarked that in their work one saw genius developed by education. Education was a good thing, and genius was a good thing; but neither was of any good without the other. In the training of a gas engineer, he did not agree with the author that it was too early to begin to specialize before a lad reached the age of 15 or 16 years. If grammar schools and other educational establishments of that character would give more attention to specialization in the education of a youth, it would help materially in the objects they had

in view in this discussion. Neither could he agree with the remark that Euclid was out of date; it was one of the best foundations a boy could have to fit him for his future life.

Mr. J. T. Lewis (Wellingborough) confessed that his feeling in this matter was much more in sympathy with the remarks made by Mr. Hunt than with the author in respect of the training of the gas engineer of the future. His opinion was that, when a boy was at school, he should take up some line of education which would fit him for his future life. He thought Mr. Berridge was hardly consistent in bringing before them a paper dealing with the education of a gas engineer, and then ridiculing education in certain respects. He proceeded to speak in favour of learning Euclid; a knowledge of Latin and Greek, to a certain extent at any rate, he regarded as an excellent thing; and was very pronounced in his views as to the necessity in these days of a knowledge of French and German. Alluding to the question of lectures and obtaining grants for the purpose, he asked how, seeing that gas managers were so very scattered, they could approach a county council and ask for a grant for giving instruction in gas manufacture. In the case of colliery owners, it was a very different matter, because in a colliery district there were a large number of collieries, and then it was quite a simple matter to approach the county council and ask for a grant for the purpose of teaching matters affecting colliery working, just as in his county the council had appointed a special lecturer to teach boot and shoe manufacturing. The funds at the disposal of county councils were certainly limited; and he did not think it would be possible to secure a grant from them for giving instruction in gas manufacture. To his mind, the gas manager must in the future have a more definite training than in the past.

Mr. P. H. Fletcher (Evesham) thought that Mr. Hunt was quite right when he said that, in the first place, a thorough training at school was the correct thing for a gas engineer. Undoubtedly this was so, because if they could do this nearly all the subjects enumerated in the paper were embraced in the studies. But, unfortunately, such a condition of things practically only appealed to students with means, and Mr. Berridge in his paper had set out the course which students could follow who had not the means of doing as Mr. Hunt suggested. There was not the least doubt that those who had the advantage of a thorough training at school in the subjects specified in the paper, and other subjects which could be added, had a great advantage over those who had to learn them and do practical work at the same time. Next to the school training, if a gas engineer was to be an engineer in the true sense of the word (which he thought meant the constructive side of the business), the best training he could have was in the workshops. He believed a youth could get much more practice if he was attached to a firm of constructing engineers than he could possibly acquire at any one gas-works, because, even in the largest of works, the same kind of work was not done many times during the period for which a pupil was articled; but if he was attached to a contractor he had the opportunity of seeing similar work done probably under very varying circumstances. Thus he must get a wider practice than he could do on one works. Then he (Mr. Fletcher) had no doubt, and no one could have any doubt, that the longer time the pupil could have in studying manufacture the better. He also held the view that the gas engineer of the future must be a thorough electrician, because he believed the two concerns, except probably in the very largest towns, would have to be run side by side. There was room for both gas and electricity; and the one could not keep the other out. Therefore the best thing to do was to be in a position to deal with both. It was very probable in the future that the electrical gas engineer would make his own gas to drive his engines instead of depending upon other power.

Mr. G. Duncan (Melton Mowbray) considered that one of the most vital points in the training of a gas engineer was the workshop practice; and this could not be obtained in any technical school. He held that seven years' training in engineering shops—foundries and the other departments—would fit a man to hold his own. There was no getting away from the fact that the German method of teaching physics and other sciences was better than our own. With Mr. Berridge's remark about the toy workshop, he agreed to a certain extent; but he did say that young men of the profession at the present day had nothing to complain about in regard to opportunities for higher technical training. Referring to Mr. Helps's observations, he held that gas engineers and gas managers were one and the same thing.

Mr. J. S. Reeves (Bilston), alluding to the point raised by Mr. Berridge, that a course of lectures might be instituted in Birmingham for the benefit of gas engineers, observed that Mr. Hunt had remarked that, though in Birmingham they had a University, and had had for a number of years a first-class college, it would be very likely that none of the professors, however eminent they might be, would be able to teach gas engineers much on the higher technical questions of the profession. He (Mr. Reeves) wished to confirm this so far as his experience would permit him to. Some ten or twelve years ago, an eminent Chemist in Birmingham (Dr. Tilden) gave a course of lectures at Mason College on "Combustion." These lectures he (Mr. Reeves) attended, and followed closely. Some three or four of them were admirable; but when Dr. Tilden came to treat of gas-retorts, he did not think that even an apprentice would have learnt much as to what was really going on in a gas-works. This was his experience; and therefore, if they were to have lectures, they must be on specific branches of gas engineering, by men absolutely competent to deal with them.

The President, in closing the discussion, drew attention to this remark of the author's: "He [the student] will have all the advantages which follow from having performed experiments with his own hands, will have acquired some considerable amount of manual dexterity, and, we hope, of power of thinking clearly." He (the President) supposed that was the object of all education, to enable them to think clearly. Whether they went in for the methods advocated by Mr. Berridge or those advocated by Mr. Hunt, they must make up their minds which they believed in, and which would bring about the result best. But anyway, what they had to aim at was the power of thinking clearly. Having quoted from the Presidential Address of Mr. J. F. Wallace to the American Society of Civil Engineers meeting in London last year, the President proceeded to remark that one thing Mr. Berridge did not lay sufficient stress upon, was the accumulated amount of knowledge that the gas profession had in the bound volumes of the "Journal." In his opinion, it was the duty of every gas engineer to keep these volumes accessible to his assistants, who should have every encouragement to search the volumes from time to time on subjects that might arise regarding engineering or chemical questions. He himself had found these volumes splendid text-books. Now about Mr. Berridge's suggestion on the question of making a united effort to do something, he thought it would be a good thing if their assistants in the Midlands had an Association of their own. They were shut out from these meetings; and it was a deprivation. The meetings were a means of education; this the members themselves acknowledged. But these young fellows were excluded. Many of them would like to contribute papers, some of which would be of interest, and some would not. But many of the papers would be of interest to themselves, and so they ought to encourage their assistants to have an organization of their own; and then perhaps the Association could help them with a course of lectures. He remembered with a great deal of pleasure some lectures he attended in Liverpool on tar distilling; and he looked back with considerable gratification to the knowledge then acquired. He certainly thought they should take into consideration the suggestion made by Mr. Berridge for a united effort being made to educate their assistants.

Mr. Berridge, in the course of his reply, remarked that he was glad the speakers had not all agreed with him; but he was going to have the audacity of agreeing with his own opinions, and of backing them up. In answer to Mr. Helps, he explained that he advocated attendance at the secondary schools and the use of the workshops until a youth arrived at (say) the age of 16. In many places, these secondary schools were fitted with excellent workshops, where a youth could learn methods of manufacturing, and get an insight into all sorts of machinery. But, of course, he did not suggest this in place of anything that might be learnt afterwards. A lad would take more interest in going and learning in these workshops than he would do from a book. Mr. Helps also suggested that the study of mathematics should be extended over the whole four years; but he (Mr. Berridge) maintained that, when an educated youth arrived at the age of 16, he knew mathematics pretty well. That there was a distinction between gas engineers and managers was all nonsense; they were all gas engineers and managers. He agreed that the last lines of his paper appeared rather misleading; but to perfectly understand what he wished to convey, they should read the particulars that had appeared in their professional journals on "Technical Instruction in Gas Making in Germany." When a man was the age of 25 or 26, he was recommended to go for three years into a technical school altogether. He (Mr. Berridge) did not agree with that. A man at that age might give two or three afternoons a week, but he should not give up his business entirely. He would get into the way of theorizing and base-lining, and not become a thoroughly practical man at all. Adhering to his opinion on the question of the value of Euclid, he passed on to Mr. Hunt's remarks, and observed that he (Mr. Berridge) did not think there were half-a-dozen men in the room who could afford to keep their sons at school until they were 18 or 19, and besides, he did not think it would be a good thing for the youths themselves if they could. His paper was written for the bulk of gas engineers and managers, not for those at the top of the tree. Having expressed his thorough agreement on the question of physical exercise, he said he thought it was quite true there were not many professors at Mason College who could teach Mr. Hunt anything in regard to his profession; but they did not all possess Mr. Hunt's acquirements. Some years ago, he attended a course of lectures at the University College at Nottingham, and received great benefit thereby; and therefore he could not condemn lectures of this character. As to the course of instruction set out in the paper, Mr. Bell thought he ought to have included inorganic chemistry; but he (Mr. Berridge) maintained that, if a boy had attended a secondary school, at the age of 16 he would know all that was necessary about the subject. In writing the paper, he had, of course, assumed that the student had received a primary education in general elementary science. He thanked Mr. Samuel Glover for his remarks, and concluded by disagreeing with Mr. Duncan as to such a long period as seven years being spent in training in the workshops.

Mr. W. R. Cooper (Banbury) asked the members to join him in a hearty vote of thanks to Mr. Berridge for his excellent paper. He then referred to the spread of technical schools throughout the country, and gave at some length information as to the methods pursued, and the results achieved, at their fine technical school at Banbury. He was one of those who did not despair of the future of the gas engineering profession.

Mr. HUNT, in seconding the motion, said he should like to say that he considered both chemistry and engineering were essential parts of the training of a gas engineer. What he had in mind when he previously spoke was that it was better to do one thing well than two things badly; that it was better to be a good engineer than an indifferent engineer and an indifferent chemist.

Mr. MEIKLEJOHN added a few words of appreciation of the paper.

The motion was heartily agreed to; and Mr. BERRIDGE briefly expressed his obligation to the members for the kind way in which they had received the contribution.

THE NEXT MEETING.

The PRESIDENT mentioned that he was trying to make arrangements with his Committee to receive the Association at West Bromwich for the summer outing in May; and he hoped the visit would be a pleasant one.

AN INTERESTING DEMONSTRATION.

By means of two gas standards and other apparatus which the President had arranged on the table, he gave the members an illustration of the naphthalene oil-washing process referred to in his address, and the enriching effect of benzol on gas previously deprived of a large part of its luminosity by means of washing. He demonstrated that, in the washing of the gas to rid it of naphthalene, the addition of a little benzol to the oil would ensure that the gas would not be impoverished.

This concluded the proceedings.

NEW RETORT-HOUSE AT DORKING GAS-WORKS.

The increased demand for gas in the district supplied by the Dorking Gas Company has necessitated the extension of the works; and the Engineer and Manager (Mr. S. Carpenter) was instructed to take the matter in hand. He accordingly did so; and the work has been carried out effectively and with expedition. The extension comprises a new retort-house, furnished with regenerative settings and coal elevating and conveying machinery, and designed for the production of 500,000 cubic feet of gas per day. The house is 90 feet long, 40 feet wide, and 36 feet high. It is substantially built in red facing bricks, with blue brick plinth and yellow gault oversailing courses—the walls being panelled; and it presents a very effective appearance. It is arranged for eight settings of eight retorts; and the bench is built on Hislop's regenerative system, with coal bays having a capacity of 450 tons in front of the settings. It is fitted with a stage-floor, the framing of which is composed of 8 in. by 6 in. steel joists and 4 in. by 4 in. T-irons, built in with clinker concrete, and paved with 2-inch blue chequered bricks. The chimney-shaft is 80 feet high and 10 ft. 6 in. at the base, reduced to 7 ft. 6 in. at the top—the flue being 3 ft. 6 in. square. It is faced with red brick; and blue bricks are used for the panels, with blue recessed medallions. Railway

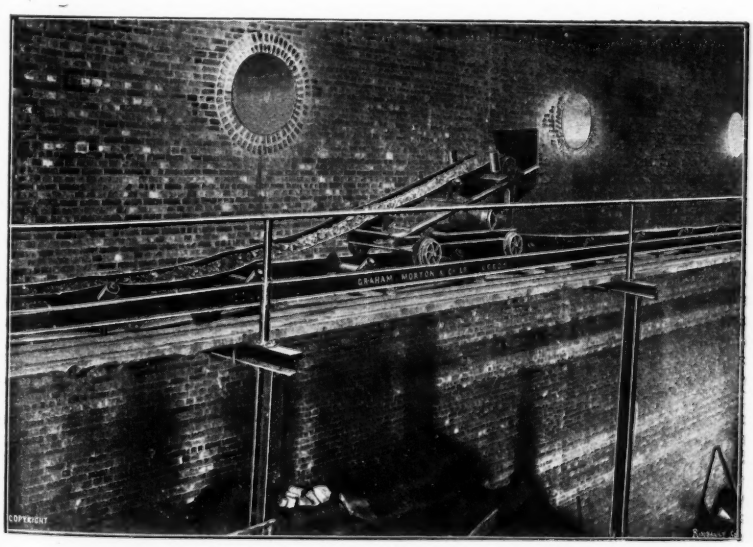


FIG. 1.

communication not being obtainable, it was decided to handle the coal automatically by means of elevating and conveying machinery; and it is now tipped on to the grid of the elevator, and raised to the improved belt conveyor which runs the whole distance of the coal-stores. Owing to the smallness of the coal used at the works, a coal-breaker was not necessary. A screen made of flat bars has, therefore, been adopted; and it is found that at least 80 per cent. of the coal carbonized passes through the mesh. The cost of handling the coal and placing it in the bunkers in front of the retorts is a little over 1d. per ton.

We give two illustrations of the conveying plant. Fig. 1 shows the grid, elevator, &c., passing through the wall of the retort house; fig. 2, the belt conveyor with idler rollers. The improved

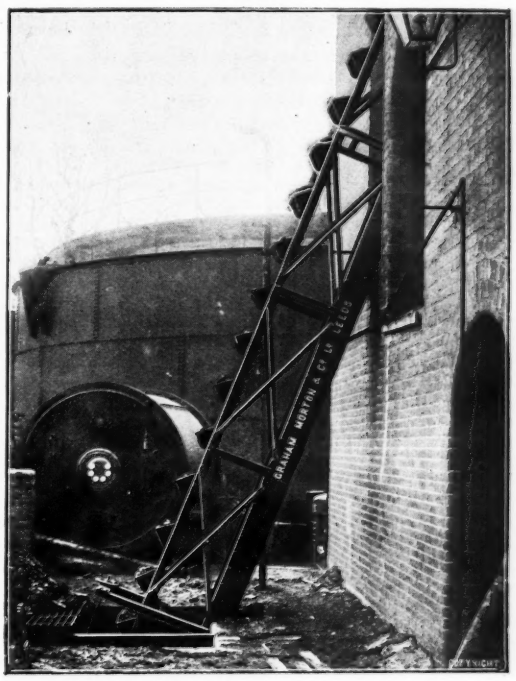


FIG. 2.

form of throw-off carriage which has been adopted will be seen in the reproduction of the photograph. Alongside the conveyor track is fixed a wood gantry with the necessary hand-railing. The house was designed by Mr. Carpenter; and the elevating and conveying plant was erected by Messrs. Graham, Morton, and Co., Limited, of Leeds.

The Durability of Cement Steel Structures.—It is interesting, at the present juncture, when there is so much talk in the air of the electrolysis of gas and water pipes situated in subsoils permeated by electric currents, to be reminded by the "Engineering Record" that an investigation conducted by Mr. Carl Hambuechen, of the University of Wisconsin, and published in the "Bulletin" of the Institute for July, 1900, supports the view that all corrosion, or rusting, of iron and steel is probably an electrolytic action. At any rate, the phenomenon is always attended by conditions which are equally essential for electrolytic action to take place. It is pointed out by our contemporary that these conditions are completely negatived in the case of armoured concrete, or of metallic structures buried in cement concrete, which consequently become as enduring as masonry. Thus is solved, wherever the conditions are producible, the problem of rendering iron and steel structures imperishable. Within the ordinary limits of strain imposed upon metallic structures, the fatigue of the material does not count for anything. If oxidation can be prevented, therefore, there is no reason why such structures should not last and do their work for an indefinite period. Preservative painting is good, so far as it goes; but it is costly, and a constant care. It is even worse for those parts of metallic structures whither the paint brush cannot penetrate. Their corrosion it is which often determines the life of the whole erection. Engineering opinion has come to the conclusion that, wherever it is feasible to dispense with the necessary evil of painting for ironwork, this should be done. One (and the best) alternative is to embed the metal in a cement concrete matrix. This ensures the perfect dryness of the metal, because all the water in the concrete enters into crystallization, and goes on doing so for a long period after the first setting. There is no electrolysis under these conditions—that is, there is no local electrolysis. Wherever properly designed and constructed concrete-steel composite structures have been examined, the metal has been found to be perfectly preserved.

VALUATION OF GAS LIQUOR.

By F. J. R. Carulla.

[A Paper read before the Nottingham Section of the Society of Chemical Industry.*]

Although ammoniacal liquors are being obtained in increasing quantities from the operations connected with coke-ovens and blast-furnaces, the large bulk of the make is still produced at the gas-works. At one time it used to be worked up almost exclusively by chemical manufacturers; but gradually this process has become part of the gas manager's business. The reasons for this change, and for the apparent encroachment, must interest this Society, representing, as it does, chemical manufacturers as distinguished from the gas industry.

Clearly, a raw material such as gas liquor, that, on an average, contains no more than 2 per cent. of ammonia, the remaining 98 per cent. being practically waste, is not an article that can be despatched to long distances. It will not stand heavy carriage charges, and, consequently, large gas-works not conveniently situated in regard to chemical works are compelled to work the liquor up themselves. Occasionally, however, a chemical works close to a gas-works is suddenly deprived of a commodity that is perhaps necessary to its very existence. Such a state of things can only be due to some serious misunderstanding; and the question is, How can it have occurred?

The chief cause of dissatisfaction is the system of sale and purchase that is generally adopted. The chemical manufacturer usually buys the liquor at a fixed price, but cannot sell his make of sulphate of ammonia ahead in the same way. As the price of sulphate varies enormously, without the manufacturer being able to influence it, the time is sure to come when he is selling at a loss. The gas company then have no cause to complain. On the other hand, sulphate prices may rise when the chemical manufacturer has a low-priced contract for gas liquor. The gas company—not unnaturally—regret the loss of the considerable profits that they might be making, regardless, however, of the periods of low prices (sure to recur) when the chemical manufacturer has been losing money.

It is surprising that no great effort has ever been made by those manufacturers interested in this industry to bring about a change, making affairs more satisfactory to all concerned. It must be evident that a sliding-scale instead of a fixed price would get over the difficulty.

The first consideration that arises, whatever the method of sale may be, is how the strength of the liquor is to be ascertained. The most usual way is to take the specific gravity by means of Twaddel's hydrometer. Strange as it may appear, this is in many cases (especially with the low strengths), a perfectly fair estimate of the contents of ammonia in the liquor. It is not always so; but with the coals used in this district, and the strengths usually produced, the cases in which the indication is not a fairly true one are very rare indeed. The Burton Gas-Works, for instance, producing a liquor that seldom exceeded 4° Twaddel, yielded results accurate absolutely to the first decimal point.

The following are some tests made to check a certain lot of liquor:—

Twaddel Degrees at 60° Fahr. Actual.	Ounce Strength by Distillation.	Equivalent Twaddel.
3·3	6·73	3·36
3·9	7·93	3·96
3·9	7·83	3·91

Mr. F. L. Ramsden, the Engineer and Manager of the Burton Gas-Works, informs the author that nearly all the coal and cannel from which this liquor was obtained was from the North Derbyshire district. These and other analyses referred to in this paper were made by Mr. E. M. Glover, who has had a very long experience in this particular test.

Considering that free ammonia lowers the specific gravity, it is a remarkable fact that, as the density of gas liquor rises, the contents of ammonia also increase. The rate of increase is, however, not always even; and there is no doubt that, with strengths of 7° and 8° Twaddel, the hydrometer test is only an approximation. But as there is usually an increase of real strength over that indicated, it is a matter easy of adjustment when fixing the price, and does not prevent the use of the hydrometer, which is an immense convenience wherever this instrument can be employed. In some cases where the hydrometer is inapplicable or objected to, and where yet expedition has been desired, a method known as the "saturation test" has been applied. This test is only of interest as having given origin to the expression "ounce strength," for in reality it does not always yield reliable results. The test, conducted as it is by the direct saturation of 1 gallon of the gas liquor with sulphuric acid, the number of ounces used being noted, will fail to give the ammonia combined with strong acids. An actual analysis becomes, therefore, the only alternative where the hydrometer is inapplicable, as, for instance, in liquor containing free ammonia, or in that from tar-stills, &c., or where the liquor supplied is very variable. Such an analysis is always carried out by the well-known method of distillation.

By the kindness of Mr. John Phillips, Secretary of the Bristol Gas Company, the author is able to give particulars of the modification they adopt. The description is of special interest, as it is issued to would-be contractors for the purchase of their gas liquor, with the forms of tender to be filled in with prices on a sliding-scale based on the market value of sulphate of ammonia. [*Vide* foot-note.]

Having fixed on the method for ascertaining the strength of the liquor, the next point is, What basis should be taken for the price of sulphate of ammonia? As this price is published weekly in the "Journal of Gas Lighting," the "Chemical Trade Journal," and a number of others, it is easy to agree upon some publication from which to take it. Then comes the question, What proportion of the current value of sulphate of ammonia shall be allocated to the chemical manufacturer, and what to the gas company? Whatever the price of sulphate may be, the cost of its manufacture from any particular strength of liquor, apart from the cost of the liquor itself, varies very little. Of course, it varies considerably when coal doubles in price, as has recently occurred; but one is speaking of normal times, disregarding accidents and abnormal occurrences, for which, nevertheless, some provision in the nature of insurance should be made.

It is unnecessary here to enter into the details that go to make up the cost. A fair sum where the gas liquor is close to the chemical manufacturer's works, or where it is delivered free, might be £5 5s. per ton of sulphate; and if this sum is deducted from the current price of sulphate, the remainder would fairly represent what the gas company should receive for the ammoniacal liquor used in the manufacture. Having reached this agreement, it is easy to fix the price per ton for the various strengths of gas liquor that may be supplied.

The Twaddel scale is convenient, in that the number 60 divided by the strength in degrees Twaddel gives the number of tons of liquor required to make 1 ton of sulphate of ammonia. Thus, of 6° liquor, 10 tons are required; of 5° liquor, 12 tons are required; of 4° liquor, 15 tons are required; of 3° liquor, 20 tons are required—the strength in Twaddel degrees, multiplied by the tons required, always being 60.

Suppose that sulphate is £11 per ton. From these data, it might appear that the price the manufacturer should be able to pay for liquor delivered to his works would be—

$$\text{For } 6^\circ \quad \frac{£11 - £5\ 5s.}{10} = 11s.\ 6d.\ \text{per ton.}$$

$$\text{For } 5^\circ \quad \frac{£11 - £5\ 5s.}{12} = 9s.\ 7d.\ \text{per ton.}$$

$$\text{For } 4^\circ \quad \frac{£11 - £5\ 5s.}{15} = 7s.\ 8d.\ \text{per ton.}$$

$$\text{For } 3^\circ \quad \frac{£11 - £5\ 5s.}{20} = 5s.\ 9d.\ \text{per ton.}$$

But it would really not be so, as, *e.g.*, the cost of manufacture from 3° liquor is much greater than from 6°, in consequence of the much larger quantity that has to be dealt with—viz., double—to produce 1 ton of sulphate. Obviously it cannot fairly be asked of him to pay one-half the price of 6° for 3° liquor, although the latter yields one-half the quantity of sulphate.

The manufacturer can protect himself by making it a condition that no liquor shall be less than 4° Twaddel, or, what might be more convenient to both buyer and seller, to adjust the cost of manufacture to the varying strengths.

This may be done in the following manner:—

Let a = price of sulphate of ammonia.

Let b = cost of carriage of gas liquor per ton.

Let c = constant manufacturing charges, including acid, bags, carriage to port of shipment, &c., per ton of sulphate made.

Let d = variable manufacturing charges, including fuel, lime, wages, repairs, &c., also per ton of sulphate made, but their amount depending on the strength of the liquor. We will suppose that d = this value for 5° Twaddel.

Let T = strength of gas liquor in degrees Twaddel.

Let x = value per ton of gas liquor of any strength at the gas-works.

A fair manufacturing profit should evidently be included in the value d, not in the value c, as otherwise the sulphate maker is not sufficiently protected in the event of deliveries of weak gas liquor, and, on the other hand, the gas company would not derive sufficient benefit when delivering strong liquor.

Remembering that 60 divided by the Twaddel strength of any liquor is equal to the number of tons of that liquor required for 1 ton of sulphate of ammonia, it will be evident that—

$$x = \left\{ a - \left(\frac{60\,b}{T} + c + d \right) \right\} \times \frac{T}{60} \quad (1).$$

But we are supposing that the value d is for liquor of 5° Twaddel; hence, as the equation stands, it would only be true for liquor of this strength. To make it applicable to liquor of any strength, it is necessary to consider that it will take just as long for (say) 100 tons of liquor to pass through the ammonia-still if the strength is 4° Twaddel as when it is 5°. The process can be hastened or delayed in a measure; but this is not of sufficient importance

* As the rules of the Society precluded the publication of the full text of the paper until after it had appeared in the "Journal of the Society," in the current number of which it will be found, we gave in our issue for Dec. 4 last (p. 1397) an abstract of it, accompanied by an illustrated description of the modified distillation test for ammoniacal liquor adopted by the Bristol Gas Company referred to by the author, who contributed some explanatory remarks in the succeeding issue (p. 1462).—Ed. J.G.L.

to be taken into account in the present calculation. We may, therefore, safely say that—

$$\frac{5\,d}{T}$$

will represent the variable manufacturing charges per ton of sulphate made from liquor of any given strength.

Substituting this value for d, in equation (1), we get—

$$x = \left\{ a - \left(\frac{60\,b}{T} + c + \frac{5\,d}{T} \right) \right\} \times \frac{T}{60} \quad (2),$$

and, simplifying, we obtain—

$$x = \frac{T\,(a - c) - (60\,b + 5\,d)}{60} \quad (3).$$

Of course, there will be no two manufacturers who could give the same values to b, c, and d. Nevertheless, we may, for purposes of illustration, assign values to these factors, and easily construct a table to make the matter more clear. Suppose b, the carriage per ton of liquor from the gas-works, to be 2s. Let c, the constant manufacturing charges per ton of sulphate, be 50s.; and let d, the variable manufacturing charges, be 55s.

Using the formula (3), we get for x the prices given in the following table for liquor of different strengths at the gas-works at the various values of sulphate indicated:—

Twaddel Strength of Liquor.	When Sulphate is Valued at—				
	£8.	£9.	£10.	£11.	£12.
	s. d.	s. d.	s. d.	s. d.	s. d.
3°	..	..	0 11	1 11	2 11
4°	0 9	2 1	3 5	4 9	6 1
5°	2 7	4 3	5 11	7 7	9 3
6°	4 5	6 5	8 5	10 5	12 5
7°	6 3	8 7	10 11	13 3	15 7
8°	8 1	10 9	13 5	16 1	18 9

It will be evident from this table how unprofitable the working of low-strength liquor is to the manufacturer. At the low prices of £8 and £9 per ton for sulphate, the manufacturer might actually be losing money if liquor of 3° Twaddel were *given* to him, and he had a carriage of 2s. per ton to pay upon it. As low-strength liquor is frequently worked up, and considerably higher prices than those indicated by our table are paid for it, it is clear that the liquor must be passed as rapidly as possible through the still, with probable loss of fixed ammonia in the spent liquor. At the same time, it must be added that low-strength liquor within reasonable limits commends itself to those who have to handle it many times, because any losses by leakage are not so serious as when the liquor is of a high strength.

A comparison may be made of the prices obtained in the earlier calculation for 6°, 5°, 4°, and 3° liquor (deducting the 2s. per ton supposed to be paid for carriage), and the prices in the table for the same strengths when the price of sulphate of ammonia is £11:—

Strength Twaddel.	6°	5°	4°	3°
	s. d.	s. d.	s. d.	s. d.
Price of liquor per ton, assuming £5 5s. as cost of making sulphate	9 6	7 7	5 8	3 9
Price of liquor per ton, dividing the same cost into a constant and a variable portion ($c+d$) as per table . . .	10 5	7 7	4 9	1 11

The fairness of the suggested formula by which the table has been prepared will be seen from the comparison. The sellers would get 11d. more per ton for liquor of 6° strength by the table, while the buyer would pay 11d. less per ton for 4° strength. Of course, 5° is not altered, as we have supposed d to represent the variable portion of the cost of manufacture for this strength of liquor.

In conclusion, the author would state that, although figures have been used for the sake of clearness and illustration, he only wishes to draw attention to a principle of valuation that may be modified according to the circumstances of each case, but which he believes, when properly appreciated and understood, to be capable of introducing harmony among the contending interests of the gas and the chemical industries.

Application for a Quotation for the Colonial Gas Association Shares.—At the last annual meeting of the Colonial Gas Association, a desire was expressed that the Directors should endeavour to obtain a Stock Exchange quotation for the shares. The Directors lost no time in moving in the matter, by engaging Messrs. Price and Pott, stock and share brokers, to advise as to the requirements of the Stock Exchange Committee, and to put the application into proper train. In obedience with their instructions, one of the first proceedings necessary was to execute certain alterations in the Articles of Association; but only eight were affected, and the changes were of a simple character. However, before these could be made, they had to be submitted to the shareholders; and, for this purpose, an extraordinary general meeting was held last Tuesday. The proposed alterations were read by the Secretary (Mr. A. J. Kingdon); and the Chairman (Mr. Samuel Spencer) gave a short explanation of the position of the matter. He then moved, and Mr. Samuel While seconded, the adoption of the alterations; and this was at once agreed to.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Electrolysis of Gas and Water Pipes.

Sir,—I thank Mr. Murray, the Secretary of the London Chamber of Commerce, for publishing in full the circular of the Electrical Section to which I objected last week.

If proof were needed of the necessity for gas and water companies to take action, it is to be found in the objection to the very reasonable clause proposed by the Wrexham Water Company; for what could be more reasonable than to require that the electric tramways "shall be liable for any loss or damage to the water mains or pipes of the Wrexham Water-Works Company, resulting from fusion or electrolytic action caused by any current generated or used for the purposes of electric traction," &c.

The Chamber of Commerce circular adds: "The prejudicial effect of this, and its far-reaching consequences upon the electrical traction industry will be seen at once."

The next paragraph in the circular is underlined, as follows: "*It is most desirable that no promoters should give way upon the point, or agree to any modification of the Joint Committee clause; and arrangements are being made to fight a test-case during the ensuing session, in the general interests of the electrical industry.*"

So the London Chamber of Commerce is making arrangements for one section of its members to fight another section.

I think the above quotations show conclusively that the promoters of electric traction are clearly of opinion that the Joint Committee clause—that mass of unintelligible verbiage quoted in Mr. Murray's letter last week—will not give gas and water companies any protection. This is confirmed by a statement in a letter just received by me from the Solicitors to the Wrexham Water Company. They say: "The Model Bill clauses, as at present framed, actually protect electric traction companies against any claim for compensation for any damage which they may cause by wilful or culpable breach of the Board of Trade regulations, as well as damage which may be done even when these regulations are most carefully complied with." They say that in 1899 they "got counsel's opinion to this effect, and produced it to the Board of Trade. They were somewhat startled to find that this was so, and said that they would consider the point, but with the usual result that they took shelter behind the settlement of 1893."

That settlement of 1893, to which neither gas nor water companies so far as I know were parties—at any rate, at that time, the danger was scarcely suspected—at the best is an invitation to costly and very doubtful litigation, and is not what is wanted in the interest of the public. They require real protection from the great danger to life and property that must result from the destruction of gas and water mains from electrolytic action. Such protection can be given; and gas and water companies will be greatly to blame if, through any remissness on their part, it is not now obtained.

George Livesey.

Feb. 23, 1901.

The Price of Dry Gas-Meters.

Sir,—We note in your issue of the 19th inst., a report of the meeting of the Crystal Palace District Gas Company; and while fully appreciating the remarks of the worthy Chairman (Mr. George Livesey) regarding the unnecessary increase of price in coal, and through it the increase in the price of gas, they do not apply to some of the articles which are supplied to gas companies. We are chiefly interested in the manufacture of dry gas-meters; and at the early stages, when coal and other commodities which were being used by gas companies were increased in price, we, as meter makers, took an early opportunity of seeing our principal customers. We were told by them that, if we did not put up the prices of dry meters, when the fall came in the price of metals, that should be favourably considered by them. Now no one would suggest that Mr. George Livesey wishes to give a wrong impression to the gas industry; but you will note, on p. 471, near the bottom, a remark "and meter makers did something of the same kind." What we are anxious to lay before the gas world is the fact that dry meters have not been increased in price. Further, there is also an idea that the prices of dry meters, whether ordinary or prepayment, are being kept up at a higher price than is necessary to give the manufacturer a fair profit, and to allow his workmen a fair living wage. At the present moment, as has always happened in years gone by, there are certain firms who wish to snatch accounts by going to large companies and giving them a reduction in the price of dry meters; but if it is fairly gone into, the following facts will be found.

The dry meter has given to all gas companies a great security as to good manufacture, by being guaranteed for five years. Year in and year out, there always arises a new firm who comes along and undercuts prices with the object of opening an account; but it will be found that many of these firms or individuals have only one interest to serve—viz., to snatch accounts—and after a few years they disappear. They leave no assets behind, and no reputation, which certain firms at the present time are justly entitled to—viz.; that of honest traders giving a good article at a fair price. It would be worth while to many gas companies to look into the number of these cheap meters of defective manufacture that they have in their stores. They amount to many thousands throughout the country, which have been bought at a reduction of 5 or 10 per cent. under the prices of the honest manufacturers; and these meters at the present moment are of no value to their companies—being all lost capital.

The fact is patent that manufacturers of dry meters during the last two years have had to pay considerably more for their raw material. Take the price of tin, copper, tin plates, and to a small extent coal, which affects the price of gas. Now is it fair to ask a reduction in the price of dry meters at the present moment? There is not the slightest doubt that, if gas companies wish for a cheap dry meter, *with no guarantee*, some firms will be able to supply them with this article. But what does it mean? It means a depreciation in the high quality of

these meters, to the detriment of the gas companies; and we should respectfully suggest, although it is outside our lines, that there should be co-operation in the gas industry, and that it should be united in all things. The manufacturer is not allowed to attend any of the gas conferences. Is it not possible for a conference of gas engineers and suppliers of gas materials and gas plant from top to bottom, to be held every half year, and to work in harmony for the gas industry in general, and form certain modes by which it would be impossible for the suppliers of the raw material to so enhance prices to the detriment of the general industry?

There is a strong feeling in many industries outside that of gas, that the users of raw material have had to pay most excessive and cruel prices; and many find that, after they have worked off their stocks, the prices which are charged do not go into the hands of the manufacturers, but into those of syndicates and speculators, who are in a position to reap in a year or two a handsome reward, and then retire to leave the producer and user to realize the painful fact that he had to pay the cost when he was called upon.

These remarks may appear rambling to many; but they are for one object—to bring it home to the offenders, and let honest firms have their just due. Some years back suppliers of materials to gas companies in many sections of the trade were pitted against each other to cut prices; and that policy was followed to such an extent that all the firms discovered that such a proceeding was ruinous. They therefore arrived at the natural conclusion that it was no good working for nothing, or, still worse, sweating their employees down to such a low ebb that they could not live. The result has been that a large majority of the older-established firms did agree to supply gas companies at a fair price in consideration of the good article they supplied; while others have taken advantage of it, and put excessive prices on their goods, which is in excess of honest trading.

As a parting word, we would suggest a meeting, fairly represented by the large gas companies, together with certain representatives from suppliers of raw material and manufacturers of all necessaries for the conducting of the gas industry. Gas companies will then find that the manufacturers are, as a rule, honest traders, and men who appreciate the fact that, if they put an abnormal price upon their productions, it affects their interests adversely by handicapping the gas companies, who have many opponents now to fight in the way of heating and lighting.

Clerkenwell, E.C., Feb. 23, 1901. THOMAS GLOVER AND CO., LTD.

High Pressure Gas Distribution.

SIR,—Your articles on this subject have been most interesting to me; and, for the benefit of the gas engineering profession, it is to be hoped that the "masters of the gas industry" will give their up-to-date opinion upon the matter. If your invitation to discuss this question in your columns is neglected now, competition and other forces will compel attention to be given to it sooner or later. One cannot help but express amazement at the tenacious manner in which a large proportion—probably the majority of gas engineers—stick to the idea of supplying gas at comparatively low pressures, in an erroneous attempt to keep down leakage.

It is such a far cry from British methods to Mr. Shelton's practice of converting a distributing gas-main into a compressed cylinder, and thereby dispensing with storage by means of gasholders, that for the present more practical benefit will probably accrue from discussing the utility of mains as a distributing agency only. Even here again there is such a tremendous margin between your hypothetical maximum of 18 inches of head-pressure and present-day practice, that between the two the gas-mains will be found capacious enough for a good many years to come, before the debate upon what is or is not the maximum delivering pressure becomes one of practical politics in the sphere of distribution.

One is astonished to find even yet how general is the belief that there is a necessary connection between the amount of pressure at the outlet of the governors and the proportion of unaccounted-for gas. My own experience does not support that belief.

From the works under my charge, the district is supplied through two governors—one for the higher portion, and the other for the lower portion of the district. From each of these, there is a leading main of 12 inches diameter, which, after supplying a number of branch mains, in each case diminishes to 8 inches diameter at a point not more than 500 yards from the works. Altogether, we have about 24 miles of mains, with an annual consumption per mile of about 2½ million.

When I was appointed to the control of the works, complaints of shortage of supply were numerous—working with an initial pressure of 10-10ths and 13-10ths respectively during the period of light demand, and 18-10ths and 22-10ths respectively during the period of heavy demand. These complaints were swept away by increasing the pressure. Since that time (4½ years ago) the annual output has increased over 50 per cent., and about 3 miles of mains have been laid from points which were previously terminal. The gradual increase in the demand has been met by a gradual increase in head-pressure; the latter at the present time being as follows:—

Midnight to 5.30 a.m.	.	Higher District	10-10ths;	Lower District	14-10ths.
Other Hours—Minimum		,, ,,	18-10ths;	,, ,,	25-10ths.
,, ,, Maximum		,, ,,	25-10ths;	,, ,,	35-10ths.

Coincidently with this increase in head-pressure, the leakage has decreased. In 1896, it was 16 per cent. In 1899, it was 7⅘ per cent. Last year there was a slight increase to 9 per cent., which is more than accounted for by several breakages to mains caused by sewerage operations.

Few districts, I believe, indulge in systematic testing of mains for escapes; and small escapes from leaky joints, which with low pressures would be insidious, more readily betray themselves with higher pressures. (If anyone is in search of a metaphor, he is welcome to use this as illustrating the operation of coal prices during the last twelve months.)

I do not see any insuperable objection why we should not go on for years increasing the pressure to meet an increasing demand, instead of resorting to the costly process of enlarging the trunk-mains, and adding to capital expenditure.

We are told by one of the promoters of the Mond Gas Scheme that the distribution of this gas will not suffer any disadvantage as compared with coal gas on the score of increased capital expenditure on mains, as the disadvantage of less calorific value will be compensated for (in this respect) by resorting to much higher pressures. If the Mond gas is distributed at a pressure of from 4 to 5 lbs. per square inch, coal gas will actually compare disadvantageously so far as concerns capital expenditure on mains.

If consumers had always at hand a distributing pressure of (say) from 8 to 12 inches, without resorting to mechanical means, intensified gas-lighting would undoubtedly receive a great impetus.

Again, this question has a certain bearing upon the problem of electrolysis. How much danger there is to be feared on this point is not yet clearly revealed to us; but it is certain that if there be danger, it will be proportionately minimized by increasing pressures, instead of enlarging gas-mains.

Longwood, Feb. 23, 1901. JNO. HY. BREARLEY.

SIR,—After reading the first article under the heading of "Essays and Reviews" in the "JOURNAL" for the 19th inst., I fear that you will think me somewhat bold in attempting to show a practicable possibility of such a system becoming workable, the result of which must be an enormous saving of capital.

The reduction in the size of mains means less cost to fit together, smaller trenches, lighter tools and material, quicker despatch, and small surface for leakage. To carry out the above the compressor must be of first-class make, with a good cooling jacket and double acting; and the connection to the high-pressure main should be of a gradual taper, with a clean surface inside. Also at this point an automatic pressure-regulator should be arranged, so as to maintain a pressure of 40 lbs. or 50 lbs. to the square inch more or less. The main should be constructed of wrought iron or steel, and if possible be enamelled inside and out. Of course, the services will be treated in like manner. At several distances, I should propose to connect regulating receivers.

Your essay says that *friction settles it*. That is why I refer to my boldness. I cannot see what water has to do with the high pressure distribution of gas, without it is to keep the compressor cool. If water could be compressed, well and good; but it cannot be. It passes through a main or service as solid as metal itself. I have had experience with a compressor, 12 inches diameter with 12-inch stroke, which gave a pressure of 45 lbs. to 50 lbs. to the square inch, and was connected to 130 feet of inch pipe, off which there were twenty services with small jets of air and water. I found no difficulty in getting a regular pressure from each. I may state that in this case the air played the "water" into a fine spray without drip or drops.

The effect that such pressure will have upon the illuminating power of the gas must remain for the time being; but I know that to connect up to the meter the pressure must be reduced from pounds to the square inch not to tenths of inches column of water-gauge.

Sutton, Feb. 23, 1901. ALFRED GEO. BROWNING.

Geysers in Bath-Rooms.

SIR,—I have carefully followed the interesting editorial and correspondence which have lately appeared in the "JOURNAL" relative to the use of geysers in bath-rooms, &c.

I am perfectly in accord with the views that have been put forth as to the necessity of the flue-pipe; and, in common with other makers of water-heaters and geysers heated by atmospheric and luminous burners, we have always provided a flue-outlet. So far, I am glad to be able to add my testimony to that of correspondents who have preceded me on this subject. The flue-pipe should be insisted upon by all foremen employed to fix geysers or water-heaters in position.

There is another view of the question, however, which has apparently been overlooked so far, and what I should like to ask, Sir, is "Why have the geyser in the bath-room at all?" Why not have it fixed in some position where it cannot possibly become injurious for the simple reason that no one need come in contact with it?

Most houses where geysers are likely to be employed have a cellar or outhouse; and if a heater can be fixed in some such position, and still give the same or a better supply of hot water in the bath-room and also other parts of the house, would it not be a distinct advantage, and settle all controversy?

Flue-pipes, or no flue-pipes, the mere fact of powerful burners taking the "life" out of the atmosphere in a closed room is injurious to health. I wish to state that it is unnecessary that they should be in an inhabited room at all. Even when fixed with a flue-pipe, though there may be no actual danger of loss of life, geysers of the ordinary type may be harmful in the situation in which, owing to their structural shortcomings, they are bound to be fixed. The flues are often insufficient to carry off the products of combustion, without sacrificing the heating power of the apparatus.

Hitherto the only reason for fixing the geysers in the bath-room or other room in which the delivery of the hot water is required, has been that no efficient heater of any type was available. But this is no longer the case.

I think all who have had a practical acquaintance with the geysers on the market will freely admit that, while satisfactory as far as they go, they fall short in the following respects: 1. They must occupy space where there is often none to spare—having to be close by the bath or other receptacle in which the supply of hot water is required. 2. Even though fixed with a flue, they impoverish the atmosphere by consuming the oxygen—its vital constituent. 3. Sufficient flue-outlet to carry off the whole of the products of combustion is only obtained by sacrificing heating power; and even with the draught created to supply the place of the outgoing products, there is still a stuffy sensation experienced. As makers of gas apparatus these generally admitted defects in geysers have had our consideration; and for some time past we have been continually experimenting with the object of perfecting some other type of water-heater in which they would be obviated. In

an automatic instantaneous water-heater, introduced from America, we claim that this object has been successfully accomplished.

The "Monarch Water Heater" is a radical departure from all other known devices for furnishing hot water. Its efficiency is established, and the scope of its utility is practically unlimited. With your permission, I will briefly enumerate some of the special features secured. 1. It can be located in any part of the building most convenient—preferably in the cellar, where the water and gas are near at hand. 2. It is perfectly automatic in action, and can be operated from any part of the building to which the hot-water pipes extend. The opening of any of the hot-water taps automatically turns on the gas at the heater, and immediately a constant stream of hot water (according to its size) is delivered at a very high temperature. The turning off of the taps automatically turns off the gas at the heater, except a small pilot light, which (constantly burning) consumes about one cubic foot of gas per hour. 3. The cost of fixing is small; there being no storage required, or expensive arrangement of flow and return pipes. This, I may say, is the only water-heater I know of which does not require storage capacity. 4. The automatic valve is absolutely safe and reliable. It is actuated solely by the flow of water through the heater; and the pilot-light is so protected as to be inextinguishable so long as there is gas in the main.

I am sure your numerous readers who are concerned in the fixing of water-heaters will be interested to know that what has all along been regarded as the only practical solution of the flue-pipe question is at last an accomplished fact.

No heating engineer is likely to recommend a geyser to be fixed inside a bath-room, scullery, or hospital operation room, if, while securing an ever-ready supply of hot water, he can safely fix a heater farther away from the frequented part of the building, where danger from escaping fumes is entirely non-existent, and where the extraction of oxygen from the atmosphere either does not matter or can be easily provided against by the simple expedient of an open grid in the wall.

E. W. T. Richmond.

Warrington, Feb. 21, 1901.

Short Inclined Retorts.

Sir,—During the past few weeks I have read with interest the series of articles on the Zurich New Gas-Works. I note the length of the inclined retorts to be 11 ft. 6 in. only. In most English gas-works I know the length is not less than 15 feet, and more often 20 feet in the newer installations—even in gas-works of less than half the capacity of those described. Could any engineer say why the practice of using shorter inclined retorts is so largely in vogue on the Continent? If the same returns can be got by the shorter retort, inclined retorts are practicable for smaller works than hitherto—say, for a summer minimum of 50,000 to 60,000 cubic feet per diem. I am under the impression that capital charges will be higher, but cannot see that the cost of working ought to be, by the shorter retort.

Engineer.

Feb. 18, 1901.

Successful Experiment in Reducing Illuminating Power.

Sir,—Owing chiefly to the fact that we are situated very near two county towns, each supplying gas of high illuminating power, it has been our practice to give our customers as nearly as possible gas of a standard of 17·5 candles. Now we are very near a coalfield in which coal is obtainable that yields plenty of gas, but only of 15·8 to 16 candle-power. When last year all our distant coal contractors, with one accord, demanded an advance of from 5s. to 8s. per ton, I found that by using only a small portion of this better coal—say, 15 per cent.—I could produce an equal quantity of gas by making up the 85 per cent. with local coal, and then only have to pay 2s. 4d. more per ton for my raw material. The residual products did not affect the question, but the illuminating power did; and this caused me much anxious thought ere I advised my Committee to do what had never before been considered possible—use local coal. The result has been perfectly satisfactory. I do not insult the intelligence of my customers by saying that they do not know the difference, but I do say that we have had fewer complaints than ever, and that, after carefully analyzing the complaints, there are only five which can be attributed in any way to the lowering of the standard. The actual reduction has been more than a candle—sometimes a candle-and-a-half. I admit that it would be more difficult for a company to do this than a local authority; and although it is not a thing to publish, especially in one's own district, the fact remains that it has been done without any serious inconvenience, while in my case the consumers are the actual gainers.

J.

Feb. 22, 1901.

Municipal Gas for St. Petersburg.—We learn from Sell's "Commercial Intelligence" that the Municipality of St. Petersburg intend to buy out the Gas Company having the lighting of two parts of the city—Peterburgskaia and Viborgskaia. Authority was obtained to purchase the gas undertaking as far back as 1890. It is estimated that 470,000 roubles will be sufficient; so that the city will greatly benefit by the purchase.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold, by order of the Directors, £9900 of 4 per cent. perpetual debenture stock of the Tottenham and Edmonton Gas Company; being a portion of the amount authorized to be raised by the Company's Act of 1898. It realized prices ranging from £106 10s. to £107 7s. 6d. per £100 of stock. At a recent sale by Messrs. Waters and Rawlence, at Salisbury, some original 10 per cent. £12 10s. shares in the Salisbury Gas Company fetched £25 and £25 10s. each; and four new ordinary 7 per cent. shares, £18 2s. 6d. apiece—all *ex div.* Messrs. Haslam and Son lately sold 500 £10 shares (7 per cent.) in the Reading Gas Company, for which there was keen competition—as much as £16 5s. being given for some of them. The total amount realized was £7826. Last Thursday, Mr. Atkinson Gibson sold £15,000 of new stock (5 per cent.) of the Sunderland and South Shields Water Company at prices ranging from £125 to £128 10s. per cent.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1901).

The first Parliament of King Edward the Seventh was opened by His Majesty in person, in full state, on the 14th inst. The Speech from the Throne contained, as usual, a reference to the several legislative proposals which, if time permit, will be introduced by the Government during the session; among them being Bills to amend and consolidate the Factory and Workshops Acts and to amend the Public Health Acts in regard to the supply of water. With regard to Private Bills for the session, the Chairman of Committees of the House of Lords (the Earl of Morley) and the Chairman of Ways and Means of the House of Commons (the Right Hon. J. W. Lowther) have had their customary conference to determine in which House the respective Bills should be first considered; and they have decided that the following should originate in the Upper House:—

Alfreton Gas Bill, Arlesey Gas Bill, Aspatria, Silloth, and District Water Bill, Barrow-in-Furness Corporation Bill, Bath Gaslight and Coke Bill, Broadstairs and St. Peter's Water and Improvement Bill, Chester Gas Bill, Dover Corporation Bill, Dover Gas Bill, Elland Gas Bill, Faversham Water Bill, Handsworth Urban District Council Bill, Harpenden District Gas Bill, Harrogate Water Bill, Heywood and Middleton Water Board Bill, Leeds Corporation (General Powers) Bill, Leeds Corporation Water Bill, Newcastle-upon-Tyne and Gateshead Gas Bill, Newport (Isle of Wight) Gas Bill, New Swindon Gas Bill, Oakham Water Bill, Omagh Gas Bill, Otley Gas Bill, Poulton-le-Fylde Gas Bill, Prestatyn Water Bill, Rhymney and Aber Valleys Gas and Water Bill, Ripon Corporation Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Sheffield Corporation Bill, Shrewsbury Gas Bill, Smethwick Corporation Bill, South Essex Water Bill, Southport Water (Transfer) Bill, Stockport Corporation Water Bill, Stratton and Bude Gas Bill, Stratton and Bude Improvement Bill, Sutton-in-Ashfield Urban District (Water) Bill, Weston-super-Mare Gas Bill, Wisbech Water Bill.

The following Bills will therefore originate in the Lower House:—

Aldeburgh Corporation (Water) Bill, Aldershot Gas and Water Bill, Bingley Urban District Council Bill, Blackburn Corporation Bill, British Gaslight Company Bill, Burgess Hill Water Bill, Burton-upon-Trent Corporation Bill, Bury Corporation Bill, Colwyn Bay and Colwyn Urban District Gas Bill, Crawley Gas Bill, Cromer Water Bill, Derby Corporation Bill, Derwent Valley Water Board Bill, Devonport Corporation (Gas) Bill, Devonport Gas and Coke Bill, Dorking Gas Bill, Gaslight and Coke Company Bill, Golborne Gas Bill, Gravesend Gas Bill, Hartlepools Gas and Water (Transfer) Bill, Heckmondwike Gas (Transfer) Bill, Honley Urban District Council Gas Bill, Horley District Gas Bill, Ilkeston and Heanor Water Board Bill, Kettering Urban District Water Bill, Kingston-upon-Hull Corporation Bill, Leatherhead Gas Bill, Llandrindod Wells Urban District Council Water Bill, Llandrindod Wells Water Bill, London Water (Purchase) Bill, Long Eaton Gas Bill, Mansfield Corporation Bill, Margate Corporation Bill, Metropolitan Water Companies (Amendment of Acts) Bill, Mond Gas Bill, Petersfield and Selsey Gas Bill, Rhyl Improvement Bill, Richmond Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, Shipley Improvement Bill, South Metropolitan Gas Bill, Stroud Gas Bill, Swanage Gas and Water Bill, Tees Valley Water Board Bill, Tendring Hundred Water Bill, Wallasey Improvement Bill, Wells Corporation Water Bill, Wells Water Bill, West Surrey Water Bill, Wolverhampton Corporation Water Bill.

With the exception of the Sutton-in-Ashfield Urban District (Water) Bill, the Standing Orders have been complied with in respect of all the foregoing Bills.

As usual during the early days of the session, a number of private members' Bills were introduced. Among other subjects, they dealt with the hours and conditions of labour in coal mines, the charge of steam engines and boilers, old-age pensions, the amendment of the Borough Funds Act, the supply of light and water in Ireland, workmen's compensation, and the establishment of Wages Boards.

On Monday, the 18th inst., Mr. D. A. Thomas moved for, and obtained, a return "giving for the past year the export of coal from each port in the United Kingdom to each country abroad, together with a summary statement showing the export of coal from the principal districts of the United Kingdom to the principal groups of foreign countries, and also showing the quantity of coal shipped at each port in the United Kingdom for ships' use on foreign voyages during the same period," in continuation of the paper presented on this subject last session. Mr. Thomas has also given notice that on an early day he will call attention to the rapid depletion of the coal resources of the United Kingdom, especially of the class of coal required for the British Navy, and move a resolution. Mr. Harwood will likewise direct attention to the export of coal.

On Thursday, Sir Charles Dilke questioned the First Lord of the Treasury as to whether the Government adhered to their intention to ask both Houses to concur in appointing a Committee on municipal trading; and, if so, whether long notice would be given, and the opportunity afforded for debate. Mr. Balfour said he thought it would be very desirable that the Committee should be re-appointed, and said he should be very sorry if the re-appointment should be the occasion of any long debate in the House, especially as the matter was discussed at considerable length during the past session. He pointed out that it was in the power of honourable members to prevent the re-appointment being made after twelve o'clock at night.

Provided reasonable terms are arranged, the Ruskington District Council have decided to accept the offer of the Sleaford Gas Company to extend their mains to the area of the Authority, for the purpose of lighting the streets by gas in lieu of oil.

LEGAL INTELLIGENCE.

LIVERPOOL MAGISTRATES' COURT.—Friday, Feb. 22.

(*Before Messrs.* W. L. M'CLURE *and* E. CANNINGTON.)

Water-Gas Manufacture at Garston.

To-day a summons was heard at the instance of the Urban District Council of Garston against the Liverpool Gas Company, for unlawfully carrying on their trade in such a manner as to cause a nuisance to the inhabitants of the neighbourhood, and for not using the best practicable means of preventing or counteracting the same.

Mr. LAYTON appeared for the complainants; Mr. JOSEPH WALTON, K.C., and Mr. PERCY C. MORRIS represented the defendants.

Mr. LAYTON, in opening the case, said the proceedings were taken under section 114 of the Public Health Act, 1875. The defendant Company came into existence in 1848, and up to 1895 they manufactured gas in the ordinary way. In that year, however, they commenced to make carburetted water gas, in the manufacture of which certain processes were employed which allowed the exhalations to go into the atmosphere. In the making of the gas four vessels were used, two being covered and two uncovered; and it was urged that it was from these and from heaps of oxide of iron and spent lime that the smell came, in addition to which an oily, tarry substance was permitted to run into the sewers. At one time complaints were made of explosions during the manufacture of the gas; but these had abated for some time. There were still, however, poisonous fumes sent into the air from the operation of "blowing." The frequent use of the oxide of iron for purifying the gas also sent off fumes which poisoned the atmosphere; while the lime employed in the same process was disposed of to farmers, and in its removal emitted fumes which were exceedingly objectionable, and constituted a public nuisance. Frequent complaints had been received from residents, and a memorial was prepared protesting against its continuance; and it was in consequence of this that the action had been taken.

Several witnesses were then called, who stated that they had suffered from headache, nausea, sickness, and other illnesses which they believed were set up by the fumes emitted from the defendants' works; and it was also endeavoured to be proved that substances used in the purifying of the water gas entered the sewers, with the result that the fumes and steam escaped through the gratings into the air, and were especially noticeable during damp, foggy weather.

Mr. *T. Broughton*, Inspector of Nuisances to the Garston District Council, stated that the offensive smells from the gas-works had continued up to the present time, although they were not so bad as they had formerly been. He had himself visited the works and seen the process of water-gas manufacture; and he considered that the open shed in which the oxide of iron was placed after use, the purifying vessels, and the spent lime spread on the ground, were all causes of the nuisance complained of. He pointed out that the Company owned considerable land in the direction of Speke, which was open country, and that the tanks and sheds could be removed to a distance, where they would not be adjacent to dwelling-houses, and where they would be less likely to create public annoyance.

Mr. *F. H. Tate*, Analytical Chemist, stated that he had visited the gas-works at Garston, and had taken samples from the purifying vessels and also of the lime. He likewise obtained samples of matter from the sewers immediately adjoining the works. He found that the water in the tanks contained oil and tar and iridescent slime, which emitted a strong odour; and the lime was also impregnated with gas fumes, which were given off as the substance was removed. The samples taken from the sewers contained traces of tar and smelt of gas, which undoubtedly showed that the matter had, to some extent, come from the gas-works.

Evidence was then called for the defence.

Mr. *A. G. Glasgow* stated that he designed and constructed the works at Garston, and had been in constant consultation with the Gas Company's Engineer. He described the process of making water gas, and said that in the defendants' case the best means known to science were adopted. He could not conceive that any nuisance was caused. He had examined the lime heap, and was unable to detect any odour. There was no appreciable waste of gas such as could possibly cause a nuisance.

In cross-examination by Mr. LAYTON, witness said that, speaking broadly, they had at Garston been practically in a state of experiment. The smoke-stacks were raised in height four years ago; but he did not know that this was done owing to complaints by the Local Authority. The reason was that the heat cracked the slates on the roof.

Mr. *G. W. Gray*, Consulting Chemist and Engineer, said he had examined the duplicates of the samples taken by Mr. Tate; but his analysis showed nothing obnoxious or injurious to health. From the deposits of oxide of iron and spent lime, there was no smell of an objectionable character—only an ordinary odour.

Mr. WALTON, for the defence, said the main question was as to whether the Company had used all reasonable means of preventing objectionable effluvia getting into the air; and he submitted that they had. So far the works had been merely experimental; and, as the evidence for the complainants had shown, they might safely say that recently there had been distinct improvement.

The MAGISTRATES retired to consider their decision. On returning, it was announced that they did not agree, and therefore there would be no conviction.

SOUTHWARK POLICE COURT.—Wednesday, Feb. 20.

(*Before Mr.* SLADE.)

Gas Collector Charged with Embezzlement.

Francis Anthony, 32, a collector in the service of the South Metropolitan Gas Company, was charged with embezzling 17s. 8d., 11d., 1s., and 11d., the moneys of his employers.

Mr. PASMORE prosecuted; Mr. SYDNEY defended the accused.

Mr. PASMORE said the prisoner had been in the employ of the prosecutors for fifteen years, and was always a trusted servant. During the last two years he had been a collector in the prepayment department, and his duty was to inspect the automatic gas-meters, which were in use to a large extent in the district of the Company, make a note of the quantity of gas consumed since his previous visit, and take the money from the box. He had a large district, which took him six weeks to cover, so that this period elapsed between two visits to any one house. He carried with him a book in which he marked a copy of the registration on the meters, and by referring to the notes of his previous visit he could tell what gas had been consumed in the interval, and assure himself that the money in the receptacle was the proper amount. On the 22nd of January he visited George Row and Flocton Street, Bermondsey, in which there were automatic meters in 53 houses. On the following day, a "surprise" inspector saw these meters. The Company had no reason to suspect Anthony; but it was usual for this inspector to go round to see if everything was right. The inspector was very much astonished when he saw the meter at No. 1, George Row, the first house he visited. Prisoner's return set forth that the consumption of gas registered up to the previous day was 99,000 cubic feet; but the index then showed a consumption of 99,400 feet. It was practically impossible for 400 cubic feet to have been consumed in 24 hours, and even if it had been, there should have been 1s. 3d. in the receptacle, instead of which there was only 1d. This matter, of course, raised his suspicion. Out of the 53 houses in the two streets, he visited 48, and in 43 of them he found discrepancies representing sums varying from 2d. to 1s. 10d. The total of these was £1 0s. 6d. The 17s. 8d. mentioned in the charge represented 40 items, and the remaining three had been taken separately. It might be thought that delay had taken place in the prosecution. The Company did not wish to take any steps until they had made the fullest investigation, and they had discovered that no less than £23 had disappeared on prisoner's round in three days. The rounds of the other collectors had also been inspected; but in no single instance had the same condition of things been found to exist. Under these circumstances, the Company felt bound to prosecute.

Ernest Holden, the "surprise" inspector, gave evidence in support of this statement.

Cross-examined, he said not one in 20 meters went wrong. It was rare for the index and money in the receptacle not to tally.

Mr. SYDNEY: How do you suggest that the prisoner could have benefited, if what you say is correct?

Witness: He would make the meter come out short.

Mr. COATES (the Clerk): You mean that by stating the index at something less than it actually was, he would find more money in the receptacle than was required to be handed over, and then he could pocket the difference—that is, presuming the suggestion is correct?

Witness: Yes.

Mr. SYDNEY: Have you been on this man's district before?

Witness: Yes, about three months ago. Everything was all right then.

Mr. SLADE granted a remand, fixing bail in £100.

WATER-RATE ASSESSMENT DISPUTE AT CRICKLEWOOD.

Arbitration Proceedings.

Last Thursday, the Willesden Bench (Mr. W. Bird, D.L., in the chair) proceeded with the hearing of a dispute between the West Middlesex Water-Works Company and Mr. J. Stopp, of No. 53, Pine Road, Cricklewood, with reference to his assessment for water-rate purposes; the parties desiring the Bench to act as arbitrators, and assess the value. The matter was part heard, and had been adjourned for the Bench to consider the points of law raised.

Mr. GILLETT, Solicitor to the Company, said the dispute was as to whether the assessment of the house in question should be £30 or £31; the Company having powers, if the assessment was over £30, to make special charges for baths and water-closets. The Bench had already decided in one of these cases that a house rented at £38 should be assessed at £31 for water-rate purposes, and this should govern the present case. In this district, the consumer was rated at very much less than in other parts; the Company taking the rent actually paid, and deducting one-fourth, as under the Metropolis Valuation Act, omitting fractions. The poor-law assessment ought not to be taken, because it put the gross annual value at £35; whereas the rent actually paid was £38.

Mr. CLARKE HALL, for Mr. Stopp, contended that the annual rateable value was determined by the poor-law assessment, which, in this case, was £30 a year. The Metropolis Water Act, 1871, he said, brought the West Middlesex Company's area into the Metropolis; and for the purpose of rating under that Act, the poor-law assessment must be taken.

Mr. GILLETT said rating took place under the Water-Works Clauses Act and the Company's Private Act of 1852; and the Act of 1871 did not apply to rating purposes.

Mr. *Leopold Farmer*, valuer, said the house was fairly rented at £38; and all the houses in the road were of that value.

Mr. *Thomas Bate*, another valuer, agreed.

Mr. GILLETT said there was a great agitation in this road when the Company assessed the houses generally at £31; and twenty or thirty consumers refused to pay. Where the rent actually paid was less than £38, the Company reduced the assessment to £30; waiving their right to do otherwise if they so desired.

Mr. CLARKE HALL urged that, whereas the houses were all of the same value, it would be grossly unjust to ask the Bench to assess this house at £31, when the Company had reduced the assessments of other houses in the same road to £30.

Mr. *W. L. Morley*, Chairman of the Willesden Overseers, said, in his opinion, the gross value of the house was £35; and he considered anyone was "soft" who paid £38 rent in that road.

Mr. *Valentine Goldsmith*, owner and agent for another owner of houses in the road, said they were let at £35 and £36.

Mr. GILLETT remarked that he had twelve returns showing the payment of £38 rent.

Mr. CLARKE HALL said this did not make the general average £38. It was under £38; and the rateable value could not be more than £30 a year.

Mr. GILLETT said he had called two expert valuers, against whom a gentleman who made the poor law valuation, which was not material, and another who said some of the houses in the road were let at less than £38, had been called.

The CHAIRMAN, in giving judgment, said: By the Water-Works Clauses Act, 1847, section 68, it was provided that the water-rate should be payable according to the "annual value" of the tenement supplied. The Water-Rate Definition Act, 1885, explains that the "annual value" under the above section shall, within the unions and parishes to which the Valuation (Metropolis) Act, 1869, extends, mean the "rateable value" as settled from time to time by the local authority. Cricklewood does not come within the area defined by the Valuation (Metropolis) Act, 1869, which, in our opinion, was purposely limited under the Act of 1885. By the Metropolis Water Acts, 1852 and 1871, the definition of "Metropolis" is wider; and by section 3 of the Metropolis Water Act, 1897, the Acts of 1852 and 1871 are extended to the whole area within which any of the Metropolitan Water Companies are authorized to supply water, and this area is substituted for the reference to the "Metropolis." This would bring Cricklewood, not within the Metropolis, but certainly within the scope of the Metropolis Water Acts of 1852 and 1871. But these Acts refer to constant supply of water and fittings, &c.; and there is nothing therein with reference to the rating or ascertaining the annual value of premises therefor, outside the Metropolis, as defined by the Valuation (Metropolis) Act, 1869, section 68. The Water-Works Clauses Act, 1847, remains as from the first; and in ascertaining the "annual value" we are of opinion that we are not bound by the "rateable value" as assessed to the poor-rate, which has been ingeniously argued by Mr. Clarke Hall. We think we can take a fairer basis than the rent actually paid, which is £38 per annum; and, after allowing for repairs, fire insurance, &c., we find the annual value to be £31, and order accordingly.

Mr. CLARKE HALL: You will give me leave to appeal?

The CHAIRMAN: Oh, yes.

Mr. GILLETT applied for costs; but these were refused.

Councillors and Electric Lighting Contracts.

In the Court of Appeal last Friday, Lords Justices Rigby, Vaughan Williams, and Stirling delivered judgment in the case of *The City of London Electric Lighting Company v. The Mayor and Corporation*, on the appeal of the defendants against a declaration made by Mr. Justice Farwell, in May of last year, that certain electric lighting contracts, of which the plaintiff Company were assignees, were binding upon the defendants. Three separate contracts were entered into by the Commissioners of Sewers, in 1890 and 1891. At the time they were made, there were certain Aldermen and Common Councillors who were also shareholders in the Brush Electrical Engineering Company, who were the other parties to the contracts. The Commissioners of Sewers Act of 1848 provided that if any Alderman or Common Councillors were, directly or indirectly, interested in any contracts for works, &c., with the Commissioners, such contracts became null and void. The appellants' case was that, under this provision, the contracts were invalid. Their Lordships held that if any Commissioner, Alderman, or Common Councillor was interested in the Company, it was sufficient to vitiate a contract made by the Corporation with the Company. They declared that the two contracts entered into with the Company null and void, but did not interfere with the order of the Court below in regard to the third contract, as each party had had substantial success. They thought there should be no costs, either of the appeal or of the hearing in the Court below.

Theft from a Prepayment Meter.

At the Guisborough Police Court last Tuesday, Charles Ascough, a boy of fourteen, was charged with stealing 5s. 7d., the property of the Redcar and Saltburn Gas Company. From the evidence adduced, it appeared that the lad had entered an empty house in Hanson Street, Redcar, and, forcing open the meter cash-box with a chisel, had abstracted the contents. The boy pleaded guilty, and was fined 20s.

A "Deficiency" in the Coin Meter of an Illiterate Consumer.

The first prepayment meter case to come before the Penge Police Court was heard last Tuesday; and it was sufficiently curious to evoke a remark to the foregoing effect from the presiding Magistrate (Mr. J. Judd). Mrs. Burroughs, now living at Stockwell, was the person summoned; the plaintiffs were the Crystal Palace District Gas Company; and the amount of "deficiency" which they claimed was 10s. 4d. The Gas Inspector stated that on Jan. 21 he called at St. Hugh's Road, Anerley, where defendant formerly lived. Mrs. Burroughs had left; and he ascertained her new address. There should have been 10s. 4d. in the box of the gas-meter; the consumption of gas having been 3100 cubic feet at 3s. 4d. The lock of the meter had been broken off, and the money-box was gone. Mrs. Burroughs left the previous day. They had no notice of her going, which she should have given according to the agreement. He saw defendant at Stockwell; and she told him that she had heard that the box had been broken open and the money stolen, and that she should not pay the amount unless further summoned. She said the money was in the meter when she left the house. In reply to the Bench, Mrs. Burroughs stated that she could not read or write, and did not know that by the agreement she had to give notice of leaving the house. Mr. Judd told the Inspector hat, when people could not read or write, the utmost care should be taken to explain the contents of the agreement. Mrs. Burroughs had nothing to say in particular, and was ordered to pay within a month.

MISCELLANEOUS NEWS.

THE MOND GAS POWER SCHEME.

A Meeting in Support at Birmingham.

The Promoters of the South Staffordshire Mond Gas (Power and Heating) Company last Friday convened at the Grand Hotel, Birmingham, a meeting of gentlemen connected with the industrial life of the Midlands, for the purpose of discussing the provisions of the Bill now before Parliament. Sir ALFRED HICKMAN presided.

The CHAIRMAN moved—"That, in the opinion of this meeting, the introduction of the Mond gas system for the distribution of fuel gas for power and heating purposes (but not for illumination) from central stations, would be a great advantage to the industries of the South Staffordshire district, and should be encouraged by the manufacturers, local authorities, and others who take a serious interest in the welfare of the district." In the course of his remarks he said that he had no interest whatever in the Mond Gas Company beyond the fact that he was thoroughly persuaded that the introduction of the gas into the district would be an enormous benefit and advantage. He believed it had been proved beyond question that the gas could be made very cheaply, because the sulphate of ammonia was preserved instead of being thrown away, as it had been for so many years. He was told that the value of the sulphate of ammonia recovered was 8s. per ton of coal treated; and after the whole expenses of extracting the sulphate had been met, there was a margin of no less than 4s. 6d. per ton. This would practically pay for the material from which the gas was produced; and the whole cost of the gas, therefore, was the labour, wear and tear of machinery, and interest on capital for laying down the works. Then again, the gas was most suitable for driving machinery, and it saved all the cost of stoking and clearing away ashes. It was free from tar and dust, or from anything which would interfere with the working of an engine. The supply was very easily regulated; there was no waste when the engines were not going; and there was much less waste of the metal which was being heated, because of the absence of oxidization. There was a very large saving also in the wear and tear of furnaces; while the quality of the material produced was considerably improved. The use of Mond gas as compared with ordinary gas, was analagous to the use of charcoal as compared with coal; for there was no sulphur in the Mond gas, or only a mere trace. The one drawback to the system was the great cost of laying down the necessary plant. But this drawback would not apply if a central station were established, from which the gas could be supplied to hundreds of consumers. He understood that wherever the system was introduced, manufacturing industries would gather around it. At present he was told that opposition was threatened by some of the large towns; but it might be remembered that similar opposition was met with when railways were introduced. He believed that any town which was so backward as to impede the introduction of Mond gas would bitterly repent it; on the other hand, any district which had this advantage would take a foremost position, and no district which was without it would be able to hold its own. Though he had heard that Wolverhampton was at present taking up a somewhat antagonistic position, he had the best hopes that the antagonism would be entirely removed, and that the city would come to heartily support the scheme.

Colonel J. B. COCHRANE (Chairman of the South Staffordshire Iron Trade Association) seconded the motion; remarking that the life of the district depended on cheap fuel, and at the present time they saw manufacturers closing down their works because they could not meet competition. This was almost entirely due to the high price of fuel, and the difficulty of transit to ports and markets. The Mond gas was brought before him as Chairman of the South Staffordshire Mines Drainage Commissioners. The mines had been overwhelmed with water for years; and what they wanted was some scheme which would enable them to unwater the mines at rates which would allow of their being satisfactorily worked and developed. During the twelve months ending June last, they spent in pumping in the Tipton and Old Hill districts £14,673. From figures which Dr. Mond had supplied, he found that if they had used the Mond gas they could have done the work for £7359, or about half. But to that, of course, would have had to be added the cost of replacing steam-engines by gas-engines. He knew the coalowners would welcome anything which would alter the anxious state of things which had existed in South Staffordshire for years past; and he hoped that the local authorities would see that the introduction of any system likely to keep together the population and the industries of the district would be a very real benefit.

Mr. EDWARD HOWL related the circumstances under which the scheme was proposed. He had himself approached Dr. Mond, who did not come into the district on his own initiative, but was pressed to introduce his system here. The area embraced in the Bill included 27 local authorities—made up of 6 corporations, 18 urban district councils, and 3 rural district councils. There were in all 16 gas undertakings supplying illuminating gas—making a total of 36 public bodies to be considered. Many of these bodies were working under old Acts; and it was never intended originally that ordinary gas was to be used for anything beyond lighting purposes. The whole matter was practically in the hands of manufacturers, and their active support would ensure the passage of the Bill, for then it would be shown that the powers asked for were of public utility.

Mr. ALFRED MOND, in the absence of Dr. Mond (his father) in Italy, referred to criticisms of the scheme, and said that two of these were entirely inconsistent. It was said that the cost of the gas would be too high, and that the scheme would not pay. As regarded the first of these statements, he might explain that the Company would be composed of business men; and as Parliament would not give any powers to compel the public to buy the gas, it would have to be sold at such a price that consumers would gain an advantage by using it, or they would not buy it. In the Bill, they had fixed the maximum price at 4d. per 1000 cubic feet for small, and 3d. for large consumers; but he did not think the public would be asked to pay anything like these

prices. To those people who were concerning themselves as to whether or not the scheme would pay, he would say that, as they were not asked to put any money in it, he did not see what it was to do with them. A Syndicate of six or seven of the most influential commercial men in the Midlands were putting down their hard cash; and they had spent more days in investigating the scheme than its critics had spent minutes.

Mr. W. H. HUMPHREYS gave some particulars concerning the manufacture of the gas, somewhat on the lines of those contained in his recent paper read before the Institution of Mechanical Engineers, and reported in our pages at the time.

Sir BENJAMIN HINGLEY emphasized what he regarded as a vital point in favour of the system—it would save the good coal of the district, which was now practically approaching exhaustion, and would utilize the cheap slack, of which they had a superabundance. He was struck by the statement that there was a steam-furnace at the Mond works; for if the gas would work a steam-furnace it certainly would their iron and mill furnaces. It seemed to him that they were having salvation brought to their doors; and they must see to it that the scheme was not obstructed. Dudley had set a good example to the whole district; and if only other local authorities would follow Dudley's lead, the Bill would go through Parliament without very great expenditure. The present was merely a preliminary movement by a few gentlemen who had put their hands into their pockets with disinterested motives; but if the Bill went through Parliament, everybody would have an opportunity of joining in carrying out the scheme.

Professor BURSTALL, dealing with the question of transmitting the gas over the district through pipes, said the Mond gas could be sent under pressure which, though very moderate, was considerably higher than that used for illuminating gas. It was quite an easy matter to transmit sufficient to produce 15,000 or 20,000 horse power over a distance of six or eight miles at very moderate pressure. If the scheme were carried out, the manufacturers of the district would have something which was practically and theoretically in advance of any system at present before the public.

Mr. HUMPHREYS, in reply to questions asked by some of those present, said it was not true, as had been stated, that the gas would require pipes five times larger than the gas-mains already in use. The quantity of gas required to do the same work as ordinary gas was four times greater in volume; but the gas would be transmitted at high pressure, and there would be no difficulty about the size of pipe required. If the mains were five times as large, they would give 25 times the volume. So far as they could estimate, the maximum pressure in the mains would not be more than 4 to 5 lbs. per square inch. There was no doubt that the gas would have an odour. No producer was yet invented which would give anything like the same quantity of gas from a ton of bituminous slack as the Mond. They had had samples of the slack from the South Staffordshire district, and had found it very satisfactory for the purpose. One gentleman pointed out that if a ton of slack produced 140,000 cubic feet of gas, to be sold at 3d. per 1000 cubic feet, the result would be 35s. Add to that 8s. for the sulphate of ammonia; and they had 43s. for the power contained in a single ton of ordinary slack. But Mr. Humphreys pointed out that no allowance had been made for the cost of laying down works, machinery, and mains, and for working the process.

The resolution was then put to the meeting and declared to be carried *nem. con.*

BLACK COUNTRY AUTHORITIES AND THE MOND SCHEME.

At the last Monthly Meeting of the Rowley District Council, the General Purposes Committee reported that they had given the Clerk instructions to take the necessary steps to enable the Council to oppose the South Staffordshire Mond Gas Bill. The Chairman (Mr. W. Bassano) said he had reason to believe that the Company had provided a number of very fair and reasonable clauses for the protection of the Local Authorities. Speaking generally, the Bill seemed very fair. At the last monthly meeting of the Smethwick Town Council—the Mayor (Alderman J. Lones) presiding—a deputation from the Mond Gas Company attended for the purpose of explaining the Bill. Mr. Chance said it simply meant conferring upon the Black Country an advantage corresponding to that enjoyed in America. Dr. Mond had for some years been expending an enormous sum of money on his discovery, which had now reached a high stage of perfection. He gave instances of works where the gas had been used with advantage, and pointed out that it would benefit most districts in England, and mark an alteration unseen in the Black Country. It was a good and cheap system, would get rid of the smoke, foster trade, and place them in a better position to compete with America. He invited the Council to send a deputation to inspect the Company's works. Mr. C. W. Pinkney asked the deputation if they had seriously considered the question from the motive-power standpoint; he also inquired how much fuel would furnish a certain horse power, and the price per 1000 cubic feet of the gas delivered into the works. He was also of opinion that, in order to compete with the high-class steam-engine, the price of Mond gas should be about 1d., or at the most 1½d., per 1000 cubic feet. A deputation was appointed to visit the Company's works next Monday, in conjunction with deputations from West Bromwich and Oldbury.

MUNICIPAL GAS UNDERTAKINGS IN KENT.

On the appearance of the Board of Trade returns relating to statutory gas undertakings, many local newspapers throughout the country extract the statistics relating to the neighbouring concerns; but they are generally served up in a very dry and uninteresting state. Very few of the journalists who take upon themselves the duty of picking out the figures appear capable of advancing further. They do not seem to be endowed with sufficient reasoning capacity to comment on what they find embedded in the returns, or to extract a lesson. This being the impression which has forced itself upon us on perceiving time after time newspaper notices of the kind referred to, it is a pleasant surprise to find in a copy of the "Dover Express" a really intelligent examination of the statistics relating to the gas undertakings in Kent; and if all the papers in the county were to deal with the subject in the same way, it would be pretty safe to say that little would be heard of the municipalization of Kentish gas undertakings for some time to come. The only really good example of a gas undertaking in the county under the control of a local authority, the writer in the "Dover Express" finds, is Ramsgate; but Kent does not contain many towns of the size, population, or popularity of Ramsgate, nor would the local authorities, assuming they possessed the undertakings, all have at the helm a man of the experience of Mr. W. A. Valon. However, here is part of the article which appeared in our Dover contemporary—

The Kent gas statistics, as given in the Board of Trade returns, recently issued, present an array of interesting facts. Kent is a Conservative county not only in a political sense, but also in gas affairs; for it clings to the old ways as regards the company management. In Kent there are 29 authorized gas undertakings, of which 25 are company affairs, while only four are in the hands of local authorities, and three of those do not show results that should tempt other municipalities to follow their example. Three of the municipalized enterprises show a deficit, and one a good round profit.

Turning to the details which these gas returns supply, we find that the total capital embarked in the 29 Kentish gas-works amounted to £1,518,516; the companies being responsible for £1,325,755, and the four local authorities for £192,831. The year's revenues of the companies amounted to £295,152, and the expenditure to £277,508; leaving a profit balance of £67,644. This would be rather more than would be required to pay 5 per cent. on the whole of the sums invested; but inasmuch as nearly every company has a certain part of its capital derived from premiums, the profit allows a higher rate of interest—the average of the gas company dividends in the county being about 7½ per cent.

Looking into the details of the four undertakings in the hands of local authorities, we find that Ramsgate is a satisfactory example. The Ramsgate Corporation embarked £117,240 in their enterprise, of which amount they have now repaid £6278. The instalments are arranged so as to pay off the whole in 55 years from the commencement of the undertaking; and in the meantime the earnings, after deducting working expenses, instalment, and interest, is yielding a surplus which goes in relief of the rates. Last year's receipts produced a gross revenue of £37,367, and the working expenses amounted to £27,185; leaving a handsome balance of £10,182. Out of this profit balance, the Corporation paid £4284 in interest on the loan, £218 instalment of loan, and placed £955 in the sinking fund. This left a net balance of £4715 to be applied for the benefit of the borough, either in the reduction of rates or otherwise as the Corporation may think fit.

Ashford affords another example of the Local Authority managing a gas enterprise. Three years ago the District Council took the matter in hand, borrowing £56,790 for a term of 40 years; the rate of interest being 3 per cent., the amount of loan already repaid being £2258. Last year's working produced a revenue of £10,189, and the working expenses amounted to £8451; leaving a gross profit of £1738. There was, however, no net profit in that balance, for there had to be paid £1886 interest on loan, and £1464 had to be placed in the sinking fund, necessitating a demand for £1612 from the local rates to adjust the balance. The odd £612 may be taken as the cost of lighting, cleaning, and repairing 192 public lamps, for which no charge is made, so that the net amount that Ashford paid during the year for the luxury of managing its own gas-works was £1000. This does not look quite right from a ratepayer's point of view. But the enterprise is young; and it may be expected that in a few years Ashford gas will yield a return that will make good the annual amount now deducted from the rates to keep the concern going.

Milton-next-Sittingbourne is another instance of a District Authority providing its own gas. This concern has been running for several years. The original loan borrowed for 50 years was £4550, and of this £1118 has been repaid. There is very little scope for development, seeing that the Sittingbourne district has a gas undertaking in the hands of a Company. The receipts for the year under consideration were £2069; and the bare working expenses amounted to £2171, leaving £102 on the wrong side, and added to this was the payment of £278 interest and instalment of loan, making a loss of £380 for the year, and no free lamps. If the Milton-next-Sittingbourne Urban Authority had not the district rate to fall back upon, their gas would go out.

The Southborough District Council is the other Kentish Local Authority who are trading in gas. They were empowered by Act of Parliament to enter upon the enterprise in 1892, and have borrowed £16,749 for the purpose, of which £1609 has since been repaid. In the year 1899, the Urban Authority bought all their gas from the Tunbridge Wells Gas Company; and the expense of doing so, and distributing it, amounted to £1890, while the revenue derived from the sale to consumers was £2458, leaving them a gross profit of £568. But the interest on the loan and the repayment of instalment of capital amounted to £832; leaving a net deficit of £264 to be supplied by the rates to square the accounts.

Three of the foregoing examples do not look promising for gas municipalization in Kent; but the fourth example, Ramsgate, is encouraging, showing what can be done in that direction in a large town. In fact, the net profit at Ramsgate would be sufficient to wipe out the deficits at Ashford, Milton, and Southborough, and then leave the enterprising Thanet Corporation a surplus of £3071 on the year's working.

A comparison of the results of the municipal undertaking at Ramsgate with the figures of the Dover Gas Company follows; but in the few deductions he makes, the writer lapses into supposition. A statement as to gas prices, make, &c., is also included; and the article ends with words which a few years since might have brought gladness to the hearts of Kent coal shareholders: "It may be added that the total consumption of coal for gas making in Kent during the year was 342,778 tons. There is a prospect for the Kent Coal enterprise if the coal they are hastening to bring to the surface should be of a gas-yielding property." The vision of such a home market to-day is but poor consolation to the investors and speculators, who have become so weary of waiting that they have sought redress at the hands of the Law.

LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Sir EDWARD LAWRENCE in the chair.

The SECRETARY (Mr. P. Garnett) read the Directors' report, in which the payment of the statutory dividends for the six months ending Dec. 31—viz., 5 per cent. on the ordinary 10 per cent. consolidated "A" stock and 3½ per cent. on the 7 per cent. "B" stock, less income-tax—was recommended.

The CHAIRMAN, in moving the adoption of the report, said the Directors had no accounts to lay before the shareholders; but the meeting enabled them to announce that they were able to pay the statutory dividend for the past half year. About this there was no question. He was glad to tell them the accounts for the past half year were of a very satisfactory nature—indeed, more satisfactory than they could have expected. This arose from two causes. They had to face the rise in the price of coal; but on the other side they had the revenue derived from the increased charge for gas and also the enhanced value of coke. They could scarcely expect such satisfactory results in the next half year—at least, this was his impression. There was generally throughout the country an indication that the great boom in trade had spent itself, and that in many ways there was a tendency for the prices of commercial produce to decline. Increased trade invariably brought with it a greater demand for gas and coke, and *per contra* a decreased demand was met with corresponding results in their manufactures. Therefore they could not be surprised if during the current six months the demand for gas was not quite on a par with what it had been. During the past half year, there had been variations. In the first three months, every week showed an increase over the corresponding period of the previous year. Since then they had had week by week a decrease in the quantity of gas consumed; the result being that at the close of the year the accounts showed that the gas sold was an advance of only 0·3 per cent., or less than ½. This, however, was very satisfactory, because if they noticed what had occurred in other parts of England they would find that there had been some very serious deficits. He did not speak with anything like gloom as to the future; he only meant that they could not expect the same prosperity as they had recently enjoyed. Of course, a great deal depended upon the price of coal. It was impossible for him to attempt to give a forecast of what that might be when they came to enter upon fresh contracts during the course of the current year. There had been in steam coal a very material decline; but this kind of coal had been driven higher in price than other classes. He was afraid that at the present moment the decline in the price of gas coal was comparatively slight; and therefore one could not feel very hopeful that the figure would be very much below what it had been in the past. He trusted when the time came for making contracts there would be some reduction; but he could not encourage the expectation that it would be anything material. Still, taking all things into consideration, he hoped they would be able to show results about which the shareholders would have no reason to complain. He might say that, as regarded residuals, sulphate of ammonia had declined in price. He was afraid, too, that the decrease in the value of tar products had been very serious during the last six months; and when they came to renew their tar contracts, they would hardly be able to obtain the same price that they had been receiving during the past twelve months. Their works, he believed, were kept up to the highest state of efficiency; and all their servants were going on without any serious trouble. Last autumn they had to meet a demand of their employees for an increase of wages; and, after careful consideration, the Directors came to the conclusion that the men were entitled to some addition, and a proposal was made in respect of which a satisfactory settlement was arrived at. This tended to swell their expenditure; but it was very important that employers and employed, in a Company like theirs, should work together on friendly terms. They had always tried to do this, and up to the present had succeeded.

Mr. J. LISTER seconded the motion, and it was adopted.

It was afterwards resolved to pay the dividends recommended; and the meeting closed with a vote of thanks to the Chairman and Directors for their satisfactory management of the affairs of the Company.

NEWCASTLE AND GATESHEAD GAS COMPANY.

Annual Meeting of Shareholders.

This Meeting was held last Wednesday—Sir W. H. STEPHENSON in the chair—when the report of the Directors, noticed last week (p. 474), was presented.

The CHAIRMAN, moving its adoption, said the Company commenced the year with a credit of £3405; and, after paying preference interest and the statutory dividend of 9¼ per cent. for the first half year, and 8½ per cent. for the second half year (making an average dividend for the two half years of 8⅞ per cent.), they carried forward the respectable balance of £21,648. They had had to pay pretty heavily during the year for their coal contracts; that was a matter of history. The year was now running, and would terminate, so far as their coal contracts were concerned, on June 30; and they looked forward hopefully and confidently to the fact that when they came to renew them, they would get a very considerable concession in price. The Directors had not forgotten what had been said about the introduction of penny-in-the-slot meters. In Gateshead a district had been assigned for the purpose; and he believed that, by the end of this year, 5000 automatic meters would be in operation—first in Gateshead, then in Newcastle. With regard to the present position and prospects of the Company, the gas manufactured last year was 2599 million cubic feet—doubling their manufacture in 13 years. In the year 1887 the make of gas was 1316 millions. Their manufacturing plant had doubled during this period and their distributing plant had increased in like proportion. The increase for 1900 over 1899 was 9·48 per cent. In point of fact, Newcastle stood fourth in the whole of the United Kingdom in regard to manufacture of gas; and, with the rapid extensions that were going on in all parts of their parliamentary area, they believed that the increase would extend more largely in future. So far as capital was concerned, in 1887 they expended for all purposes £780,000; and in 1900, they spent £1,414,000 — about double what they spent 13 years ago. Their revenue in 1887 was £158,889; last year, £383,683. The gross profit of the undertaking in 1887 was £58,683; in 1900 it was £92,202. They paid in dividends, &c., in 1887, £51,492; and in 1900, £73,709. Their stock stood in the market in 1887 at 188¼; and it stood now at 225. Comparing the two years 1899 and 1900: The total receipts in 1899 were £302,920, and the total expenditure was £222,304—a gross profit of £80,615. In 1900 their receipts amounted to £383,683; and the expenditure to £291,487—showing a gross profit of £92,202. So that their receipts in 1900 were £80,763 more than they were in 1899; their expenditure was £69,177 more; and their gross profit was £12,586 more. The manufacturing charges per ton of coal carbonized during the year 1899 amounted to 15s. 5·34d.—that was the cost of coal (labour only), salaries, wages, purification, and maintenance; and in 1900 it amounted to 18s. 10·730d. Stoking machinery had been introduced at Redheugh, in about half of their carbonizing plant, and coke conveyors in a part. These, and all other means of reducing the cost of working, would be extended. Wages during the year had increased by 4 per cent. They had had an arbitration with their men, presided over by an Umpire appointed by the Board of Trade; and, after a full investigation, he awarded 4 per cent. increase. The relations between the Directors and the very large number of men they employed in their works were of the most cordial character; and it would be well if other trades would try to settle their differences by arbitration, rather than by adopting the drastic measures that had unfortunately obtained for many months between the masters and the bricklayers in the building trade. The coal carbonized in 1899 was 247,225 tons; and in 1900, 269,027 tons. The cost, including labour, in 1899, was £107,906; and in 1900, £165,733. The cost per ton of coal carbonized in 1899 was 8s. 8·753d.; and in 1900, 12s. 3·851d. This increase was entirely attributable to the fact that they had so much more money to pay for coals last year than the year before. In 1899 coals cost 8s. 8·7d. per ton; and in 1900, 12s. 3·8d. They had in the first six months of the year cheap coals. Residuals yielded in 1899 6s. 5·608d. per ton; and in 1900, 9s. 3·480d. So that they had had an advantage all round, which had been of much value to them in making up their accounts for the past year. They had paid for coals (or should have paid before the end of the contracts) no less than £215,000. For the year before, the same quantity cost them £119,000; the year before that £107,000; while in 1897 and 1898, the market value of the same quantity of coal was only £87,000. Thus for the quantity of coal for which in 1897-98 they would have paid £87,000, they were now paying £215,000. As to distribution, the cost per ton of coal in 1899 was 1s. 2·795d.; and in 1900, 1s. 2·035. With regard to management, in 1899 the cost was 7·808d. per ton, and in 1900 it was 7·602d. per ton. The quantity of gas sold in 1899 was 2,676,872,000 cubic feet; and in 1900, 2,893,603,000 cubic feet—an increase of 216,131,000 feet. The sum realized in 1899 was £210,996; and in 1900, £245,911—an increase of £34,915. The prices were in 1899, 2s. per 1000 cubic feet; and in 1900, 2s. to June, and 2s: 3d. to December. The price of 2s., less 10 per cent., was 1s. 9·6d.; and 2s. 3d., less 10 per cent., was 1s. 10·95d. The present reduction of 1·1d. and the higher cost of coals, would, by June next, absorb the whole of the £21,000 brought forward. Residuals had realized £124,962 in 1900, as compared with £79,944 in 1899—an increase of £45,017. The price realized in 1899 was 6s. 5·6d. per ton of coal; and in 1900, 9s. 3·4d. per ton of coal. As regarded capital, during the year they had raised £13,000 of 3½ per cent. debenture stock, which, with premiums, gave them £13,567; and £50,000 of ordinary stock, which, with premiums, was brought to £101,801—making a total of £115,368. They had a debit balance on Dec. 31 last against capital of £10,683; and now they had a credit balance of £27,833. They had expended for interest, in 1899, £72,789; in 1900, £73,709—an increase of £920. During the year, £565 had been paid to the families of the Company's workmen called out as reservists. Hired cookers were now fixed free; and the total number lent out had increased from 2420 to 3297 during the year. With regard to the gasholder at St. Anthony's, the tank was so far finished as to allow the contractor to commence the erection of the ironwork in September last; and he was confidently assured that it would be ready for use in the autumn of the present year.

The report was adopted.

Mr. J. G. JOEL moved that in future the Directors be paid a lump-sum of £2000, to be divided among them.

Mr. J. M. OUBRIDGE seconded the motion, which was carried.

It was agreed that the salary of the Secretary, Mr. Thomas Waddom, be increased by £100 per annum, as from the 31st ult.

The retiring Directors—Messrs. W. B. Wilkinson, P. Atkinson, and C. W. Mitchell—were re-elected; and the meeting then proceeded to discuss the Company's Bill before Parliament.

Mr. COOPER, Solicitor, explained the terms of the Bill. The first part of it, he said, was to convert the present capital of the Company to double the nominal amount of ordinary stock; and to reduce the statutory dividend from 7 to 3½ per cent. The object was to make the actual dividend paid upon the stock, correspond more nearly with the income each shareholder received. It was also proposed to convert the preference stock from 5 per cent. to 4 per cent. The next part of the Bill authorized the raising of additional capital; and all capital raised hereafter would be of the same character as the converted stock. The total sum proposed to be authorized was £900,000 by stock, and a further sum by debentures—equivalent to a third of the sum for the time being raised by ordinary or preference stock. It was proposed to extend the present limits of supply of the Company. Then it was proposed to make an alteration in the method of allowing customers discount on payment of their accounts. Their Act of 1879 provided that customers, so long as they paid their bills on or before the 10th day of the month after the accounts were rendered, should be entitled to a discount of 10 per cent.; or, in the case of large consumers, 15 per cent. The officials of the Company had found this very inconvenient—physically inconvenient; because consumers postponed till the last week the payment of their bills, and the office became, in consequence, inconveniently crowded. It was now proposed to adopt a plan that had worked well at Tynemouth and elsewhere, by which each consumer had

to pay within a certain number of days after the account was rendered. The Company would thus be able to divide their 40,000 consumers into batches, and lessen the pressure. None of the consumers would, by this method, be put to any disadvantage. They also proposed to raise the qualification of Directors from £400 to £2000.

Mr. R. URWIN moved that the Bill be approved of.

Mr. J. J. GURNEY seconded the motion, which was agreed to.

The meeting then terminated.

BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of the above Company was held on Thursday—Alderman DIX in the chair.

The report and accounts (noticed in the "JOURNAL" last week) having been taken as read,

The CHAIRMAN, in moving their adoption, said the Board had had a considerable amount of anxiety in conducting the business of the Company for the last six months. The price of coal was very perplexing, and at one time they did not know how they would be able to pull through as they had done. He was happy to say that, by the means they had adopted, they had been able to go on without raising the price of gas, as most companies in the country had been obliged to do. Notwithstanding these difficulties, they had put before the shareholders an amount which enabled them to pay their dividend and carry forward a very handsome balance. Of course, the coal market was altered now; and he thought their next contracts would be far more favourable to the Company than the last. They were creatures of circumstance; but, notwithstanding this, by the exercise of fair management, they were very pleased that they had been able to do so well as they had. There had been an increase in the consumption of gas in the past six months to the extent of 46½ million cubic feet. For the first six weeks of that period they had an increase of 24¾ millions. This showed that there was a greater demand for gas, notwithstanding the electric light and other competition that they had to deal with. So far as stoves were concerned, he thought it was equally satisfactory, for during the past half year the increase was 1523, and for the whole year 3196. In the previous year, the total increase was only 2750. They had demands for 209 more cookers, the total number of which in use up to the present time was 13,300. So far as prepayment meters were concerned, there were 4300 fixed, notwithstanding that the Company had not been able to push them as much as they should like. With regard to their extensions, he did not think the Directors had been inactive, as they had laid 10¾ miles of mains, bringing up the total length to 323 miles. Alluding to the incandescent gas system for street lighting, he said he saw that it was superseding the electric light in the Strand, and it would be found cheaper for public as well as for private consumers.

Mr. G. K. STOTHERT seconded the motion; and it was carried.

A dividend at the rate of 5 per cent. per annum was declared; and the proceedings closed.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice convening the meeting; and the Directors' report and accounts, which were summarized last week, were taken as read.

The CHAIRMAN, in his opening remarks, said it would be noticed that their Engineer, Mr. J. W. Helps, was absent that day from their meeting for the first time since he became connected with the Company as Engineer—now over some 34 half-yearly meetings. He was sure the proprietors would all regret to learn that the cause of his absence was the serious illness of his wife, who had been in a very delicate state of health for some time, and had to winter abroad—either in Switzerland or Italy. On the previous Friday, he regretted to say, Mr. Helps had received a telegram to the effect that his wife was in a critical condition, having broken a blood vessel of one of the lungs, and was suffering from hæmorrhage. Mr. Helps had gone to his wife; and in a letter received from him, he asked that his absence from the meeting might be excused. In moving the adoption of the report, the Chairman said the first thing mentioned in it was the increase in the sale of gas, which had reached the point of about 4½ per cent.; and he thought this, taking into consideration the abnormal state of the weather and clear atmosphere throughout the whole of the half year, especially in December, was a very fair result. They were still increasing; and during the first four days of this week, when the weather was cold, dull, and foggy, they had the following increases: Sunday 19 per cent., Monday 20 per cent., and Tuesday 35 per cent. On that day, they sent out 3,694,000 cubic feet of gas, which was the largest quantity day's output this season. On Wednesday, the increase was 13 per cent. During the half year, the automatic consumers had increased by 504, and the ordinary consumers by 280. The total number of consumers now amounted to 16,001. They had supplied on hire 714 additional gas-stoves; making the total number of cooking and heating stoves 7755. They were encouraging this branch of their business all they possibly could; and it seemed to keep pace with the electric light, which had been pushed very much by the Corporation, who were still further trying to increase its use by introducing free wiring. He did not think they had got many tradesmen in the town to agree to their terms for this work; and, in fact, he did not think the Corporation would get any firm to employ their capital on the meagre terms offered. During the half year, the Company had done very well with residuals, especially coke—in fact, all the residuals, except sulphate of ammonia, had been favourable, although coke had not gone up proportionately to the extra price they had had to pay for coal. Still they had obtained a very good price for coke, compared with many other districts, where the companies had a great deal of trouble in getting rid of coke at a much lower price than they themselves were getting. They might attribute their fortunate position not only to the weather, but to the help derived from the carburetted water-gas plant, in which they were able to profitably employ a great quantity of coke. Although there had been a large increase in the receipts for residuals and in the sale of gas, they had not earned their dividend by £7120. This, as he foreshadowed at the last meeting, they were quite prepared for. But seeing that they brought forward from the previous half year more than £9000, they were able to pay the dividend without dipping into the reserve fund, and still carry forward over £2000. He thought they had done exceedingly well, inasmuch as they had not resorted to the expedient adopted by a lot of companies of raising the price of gas by as much as 7d., 6d., and 4d. In their own case, the price had only been put up 2d., and then only, with very great reluctance, at Michaelmas last; while many other Companies put up their prices at Midsummer, and even earlier. The proprietors and the consumers might depend upon the Directors taking off the 2d. as soon as they could. He could not make any definite promise, as they must see how they came out this half year. They would have to pay, by virtue of their contract, the same price that they had been paying for coal during the last six months. They made a twelve months' contract when everybody supposed coal was going to be higher; but contracts made in December never turned out well because coals were generally then at a higher price than when they entered into the contracts in May or June. After paying the fixed charges, it would be seen they had £18,932 out of which to pay the dividends, and then they would have £2711 to be carried forward. During the half year, the amount expended on capital account was £11,298. The principal items comprised in this had been: New buildings, £2777; new mains (including £3131 spent on a trunk main from Waddon to Purley, to increase the output there), £5565; new meters, £705; new gas-stoves, £1711; and new house fittings, £538—making the total amount of capital expenditure, up to Dec. 31, £405,691. In regard to the revenue, the receipts from the sale of gas in the Croydon district were £40,461; being an increase of £3483 compared with the corresponding period of 1899. In the Carshalton district, the receipts were £5155, or an increase of £484. From public lighting and under contracts they had an income of £6746, or an increase of £116. All the other figures were normal, except that they all showed increases due to the additional business that had taken place. He would refer to one or two of the residuals, because they showed they had a fluctuating increase from them. If it had not been that they had to pay an extra 8s. per ton of coal, they would have had a splendid result to lay before the proprietors. As it was it was very favourable. They had produced in the half year 16,553 tons of coke, and had realized £4201 more for it, or an average price of 3·18d. per cwt. Breeze yielded £809, or an increase of £210. Tar gave an income of £1980, or an increase of £473. Sulphate of ammonia had gone back a little in the price per ton; but they had made 64 tons more, and had realized an additional £143. The decrease in the price per ton was 9s. For coal, oil, and other materials, they had had to pay a higher price. Coal, oil, &c., cost £38,233, or £14,391 more than in the corresponding period of 1899. The quantity of oil used was less by 23,049 gallons. Rates and taxes had advanced by £509, due to increased rating. With a revenue of £76,106, he thought it was a feather in the caps of their officials that the bad debts only amounted to £31 8s. 10d. The Board were assured by their Engineer that the Company were on excellent terms with their men, and everything at the works had been maintained in good order.

Mr. T. RIGBY seconded the motion, which was unanimously carried.

Mr. CORBET WOODALL moved the declaration of dividends at the rates of 14 per cent. per annum on the "A" stock, 11 per cent. on the "B" stock, and 9 per cent. on the "C" stock and Carshalton ordinary shares. Proposing this resolution, he said it had been usual to allude to the fact that they were paying the dividends out of profits earned in the six months to which the accounts referred. The past half year was an exception in this respect; they had not earned the money which they were dividing. But he did not think this would interfere at all with the sense of satisfaction and content with which they took their dividends when they looked at the accounts as they stood before them. The amount they were carrying forward before the payment of the dividend was almost exactly the same as it was this time last year. Then they carried over £18,800 subject to the dividend, and on this occasion £18,900, also subject to the dividend: The amount of the difference required to be provided out of the surplus profit (£7120) was made in the half year ending June last. That was an exceptionally good half year, and would have justified, and would no doubt have resulted in, a reduction in the price of gas, had it not been for the increase that had already taken place in June in the cost of coal; and the Board, he thought, acting with only common prudence, determined not to utilize the balance by handing it over to the consumers, seeing that they would have had to ask for it back again when they had to pay the higher coal bill. In the current half year, they would still have to pay the high price for coal, but they would undoubtedly receive a smaller amount for coke than they had done in the half year under review; and then again if they had to draw upon their reserves to the same extent that they had done in the past half year nobody need be in the slightest degree concerned about it. They had put by, as the proprietors were aware, a reserve fund of some £32,000; and they were quite prepared to make a serious inroad upon this reserve rather than put any extra burden they could save upon the consumers. Three simple figures would explain the position: The increase in the cost of the materials used in manufacture was practically £15,000, against which they had received for extra gas sold £4000, and as the result of the increased price of coke £5000. The two together amounted to £9000; and taking this from the £15,000 they had a deficiency of £6000. The difference was made up by the fact that they had spent more upon the maintenance and upkeep of the works.

Mr. SAMUEL SPENCER seconded the motion, which was unanimously carried.

The retiring Directors (Messrs. Hussey and Spencer) and Auditor (Mr. John Jones) were re-elected.

Mr. H. D. ELLIS, in proposing a vote of thanks to the Chairman and Directors, referred to the fact that the increased price of gas only furnished about one-third of the deficit caused by the increased price of coal—in other words, whereas the consumer only paid one-third

the Company, out of the balance carried forward, defrayed the other two-thirds.

Mr. BAINES seconded the proposition, which was unanimously carried.

The CHAIRMAN having responded,

A cordial vote of thanks was passed to the officials and their staffs; and two or three of the speakers referred in sympathetic terms to the serious illness of Mrs. Helps.

Mr. RUSSELL and Mr. ARCHIBALD CADDICK, the Assistant Engineer, responded—the latter also expressing thanks, on behalf of Mr. Helps, for the kind and sympathetic manner in which reference had been made to his domestic trouble.

It was decided that a message of sympathy should be despatched to Mr. Helps.

TOTTENHAM AND EDMONTON GAS COMPANY.

Gas Companies and Electric Lighting.

The Half-Yearly General Meeting of this Company was held last Saturday at the Offices, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. James Randall) read the notice convening the meeting; and the report and accounts, to which reference was made in the "JOURNAL" for last week were taken as read.

The CHAIRMAN then moved the adoption of the report. In doing so, he remarked that there might be as many matters of interest touching the work of the Company during the past year as usual, but he was sure it was in the minds of the proprietors that one or two points so overpowered the others that they became of small importance. At the last meeting, he referred to the question of the price of coal; and he then expressed the opinion that the high price would not last long, because it would have the effect of killing itself by unfortunately first of all injuring certain industries. They all regretted to know that the trade of the country had been injuriously affected; but he was not prepared to find that the effect upon the price of coal itself would be so quick as it had been. The reduction of the exorbitant price charged nine months ago had come very quickly; and they all rejoiced in the fact, although they regretted the hardship which accompanied that desirable alteration. The Directors had to consider six months ago the question of the price of gas. They knew they had this very heavy increase upon the cost of materials to pay, but they knew also, by the forecast they were able to make, that they could get quite comfortably through the half year to Christmas without increasing the charge for gas. He was quite sure he had the shareholders completely with him at the last meeting when he expressed the policy of the Board to defer as long as possible any increase in the charge. They did delay the increase; and the charge up to Christmas had not been affected by the rise in the price of coal. But as he, at the last meeting predicted, they had, as from Jan. 1, raised the price of gas by 4d. The increase was not a large one, but it represented on the year something like £10,000. Yet this sum was a comparatively small proportion of the increased expense to which the Company would be put by the increase in the cost of coal. He was not surprised to find that one or two observations had been made in letters to the local newspaper upon the extraordinary fact that, when the price of coal was going down, the price of gas was going up. The Board were quite prepared for this, and they prepared the proprietors for it at the last meeting. The accounts before them justified the action they had taken. The half year was commenced with balances amounting to something like £20,000, out of which they had to take £2400 or £2500. With a statement like this, it seemed to him it would have been unreasonable to have raised the price of gas at all. They had put their reserved fund aside expressly to save the necessity for frequent or small alterations in the price of gas; and they had used it for that purpose. But now they had to face not only the large increase on coal over the whole of the current half year, but also a falling market for residuals; and therefore it was absolutely inevitable the alteration in the price of gas should take place. The course of events had followed exactly the lines the Directors anticipated in the previous half year; and he could only repeat, in the words of the report, and as emphatically as he could, that it had been with the greatest reluctance they had altered the price of gas in the upward direction at all. It would be with the utmost satisfaction that they would put it back again to the old price, and, if possible, to even a lower one. At the present time they should be able to buy coal at not exactly the price of 1898, but getting on in that direction. He would not venture to prophesy; but he hoped that the price they would pay when they were making their next contracts would put the Company again in the position to restore the charge for gas to what it was a year ago. Looking at the effect of these alterations in the cost of materials as shown in the accounts, they worked out broadly to this: They had paid £10,000 more for materials in the half year; they had received an improved rental of £7000 for gas and products; and the difference, as would be seen, was £3000 to the bad. But they had spent upon repair and upkeep of works £1000 more; and these two items together accounted for the difference in the profits earned in the past half year and in the corresponding period of 1899. He did not think there was anything further in the accounts to which he need make reference. Upon the works they were doing very well. They had had some little disappointment; but now he was happy to say the manufacture was proceeding in a very satisfactory way. The machinery which had been introduced was doing its work thoroughly, while the laborious character of the stokers' work had been materially reduced thereby, and the cost of wages had been fairly reduced. The increase in the sale of gas in the half year was above 13 per cent., in comparison with the second half of the preceding year, in which period they had an increase of 11 per cent. These rates of increase meant doubling the output of the Company in from six to seven years. It was somewhat difficult to realize so rapid a rate of growth as this. This Company had been going on for between fifty and sixty years, and now, at a time when some people referred to gas as a moribund industry, they were growing at a rate which meant doubling in about six years—the work of sixty years was being repeated in six! They rejoiced in this evidence of prosperity; but it had involved the necessity for considerable extensions of works, constant activity on the part of the officers, and constant calls upon the shareholders for further contributions of capital. In the course of the current year, they would have to take in hand some considerable extensions of works. He was happy to say the Engineer had got the preparations very well forward; and they entertained no doubt as to their ability to meet the growing demand for gas. The new offices and show-rooms were also well forward, and promised to be a great addition to the convenience of the consumers as well as of the Company. He had only one other matter to refer to, and that was the proposals to form a Joint Board for the supply of electricity in the districts of Tottenham, Edmonton, Wood Green, and Southgate. These proposals appeared to have fallen through. The suggestion of a Joint Board did not seem to have been acceptable to the ratepayers; but he understood it was the intention of the Tottenham District Council to proceed with a scheme of their own. It seemed to him perfectly natural that they should. As a Company, they had no reason whatever to take any side in the matter. By all means, he said, let electricity come; and the Gas Company would do their utmost to show they could fulfil the requirements of those who desired light in a better and cheaper way than the rival. At the same time, he wished to say that the Gas Company had already expressed their perfect readiness to themselves undertake to meet the demand for electric lighting. If the District Council obtained a Provisional Order, the Company would be just as prepared to take over the responsibility and the cost of carrying out the work under the direction of the Council as they were two or three years ago. For his own part, he had no hesitation whatever now, any more than he had before, in saying that the Company, acting as a lighting company, would be able to do the work more efficiently and at less cost, with greater advantage to the ratepayers, than any independent authority, whether a local authority or a private company. He should like to add a few words in regard to the question of public lighting. The special inducement, no doubt, to a local authority to go into such an undertaking was their responsibility with regard to public lighting. He had had, especially during the last six months, opportunities of seeing a great deal of public lighting both in England and abroad. He had only just returned from a long journey on the Continent; and he was convinced more than ever that, for purposes of public lighting, gas stood pre-eminently superior to electricity, both in point of cost and efficiency. He hoped the Local Authorities of the district would take pains to ascertain, with some degree of accuracy, the facts with regard to public lighting under both systems before they pledged themselves to a large expenditure in that direction. Anything more beautiful than the systems of public lighting available now at a comparatively small cost by means of incandescent burners, under the special arrangements that were open to them, could not possibly be conceived. He concluded by saying that, in view of all the facts of the case, he never felt more confident than he did that day in the future of the gas industry and of the Tottenham and Edmonton Company.

Mr. JAMES WARREN seconded the motion, which was unanimously carried.

Mr. D. FORD GODDARD, M.P., proposed the declaration of a dividend at the rate of 6 per cent. per annum on the "A" stock and 4½ per cent. on the "B" stock.

Mr. H. BAILEY seconded the proposition; and it was agreed to without comment.

Mr. J. CLOUDSLEY, in moving a vote of thanks to the Chairman and Directors and officials, mentioned that he had seen a statement to the effect that the price of coal in Yorkshire was now lower than it had been for a considerable time. He remarked upon the competition of the electric light; and in this connection recommended a very strict supervision over the public lamps in which incandescent mantles were employed.

Mr. H. D. ELLIS, in seconding the motion, also alluded to the competition of the electric light. Among other points, his experience enabled him to say that gas companies had nothing to fear if local authorities supplying electricity only competed on fair commercial terms. But local bodies did not always appear to be bound by those strict principles which guided the ordinary commercial man in the conduct of his business; and sometimes they sold their electricity at a loss. In his opinion, the Local Government Board ought to supervise the accounts of local bodies, and not permit them to sell at a loss and fall back upon the ratepayers to make up the deficiency. He knew of an authority in one part of London who tempted the inhabitants to take electricity at a price at which he was confident they could not produce and distribute it. He also knew of a local authority who started an electric light undertaking something like six months ago, and already an indignation meeting of the consumers had been held, at which a Committee was appointed to wait upon the Mayor and Council to protest against the high price, the difficulty of getting the light laid on, and the inefficiency of it when it was laid on.

The motion was cordially agreed to.

The CHAIRMAN, in responding, referred to Mr. Cloudsley's remark respecting public incandescent gas-lamps. In some respects, he said, Tottenham was a particularly cheerful and lively neighbourhood. He was told that the small boys and girls had a playful habit of swinging from the lamp-posts in a way which caused vibration enough to break the mantles; and the housewives found the bases of the lamps very convenient for the beating of mats. The Engineer estimated that they were using 50 per cent. more mantles than the average of towns lighted by incandescent gas-burners.

According to a paragraph in the "Engineer," fears are entertained by certain Americans that the constant drain upon the Niagara Falls by the diversion of water for industrial purposes will detrimentally affect them; and attention has been called to the matter by the Falls Preservation Commissioners. They claim that, in the interest of preserving the lake levels—threatened by numerous canal projects—and in that of the scenic beauty of the Falls, the State should enforce its right to charge corporations or individuals for the use of this water, or by legislative enactment to prevent its further diversion.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held on Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. CHARLES HORSLEY, J.P., in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN said it was with great regret that the Directors had to announce in their report the fact that Mr. James Glaisher had, in consequence of the state of his health, resigned the chairmanship of the Company. The Directors had placed him (Mr. Horsley) in the chair; and he would endeavour to do his duty in the position. They had also to mourn the loss of their Auditor (Mr. A. G. Hounsham), who died a short time back. Mr. Hounsham did his work well, and would be much missed. The Board sympathized deeply with his family in their bereavement. As regarded the business of the Company, he thought the report now presented was the first indifferent one the shareholders had had for some considerable time; and he was exceedingly sorry that this should happen now, when he was taking the chair. But there were times when they must sacrifice something—when they had no power to do otherwise, unless they were prepared to deal with their business in an improper manner. They wanted to keep the Company on a firm footing; and to do this, they must do certain things which he trusted would ere long come right again. Of course, they all knew that coal had been at an exorbitant price. He believed, however, from what he heard from prominent men in the gas world, that the general opinion was that coals were coming down with a "slump." They had not yet come to the lowest point possible; but he hoped that in a few months' time coal would be at something like its normal figure. Then they would be free from this trouble. Coal being high, made everything dear; it was felt in every part of a gas-works. Even on the smith's fire, it told in a small way. In their endeavour to overcome this, they had raised the price of gas by 4d. per 1000 cubic feet; but he thought the increase ought to have been 6d. at least. They had hoped that residuals would have made up the balance; but they had not done so, and were not likely to do so. The coalowners suffered severely some years ago, when they lost money all round; and therefore he did not mind them getting some extra profit when their turn came. But he thought the coal people had done rather too much in that way now—some people might say a great deal too much. He did not know that coal was coming down very fast; but it was coming down. He was connected with a colliery; and they did not know exactly what was the best thing for them to do. It was absolutely necessary to buy coal for gas making; but iron and steel works, &c., could shut down their furnaces, and this was being done. There would therefore be more coal than was required; and this would affect the price. He could not tell what the collieries would do; but if they chose to keep prices up and ruin the trade of the country, they would ruin themselves too in time. One could not be ruined without the other. Turning to the accounts, it would be seen that the receipts from the water department showed an increase of £300 over the corresponding period of the previous year; while the expenditure had risen by £295. There was an increase of £400 in rates on the water part of the business, and of £200 on the gas portion—or a total increase of £600 under this head. They did all that was possible in the matter; but these were the figures ultimately agreed upon. Deducting this £400 from the rates, the water accounts would have shown an increased profit of £405, instead of £5, which was the actual figure. The receipts from the gas department showed an increase of £1042 over the corresponding period of the previous year; while the expenditure was greater by £1547. There was thus a decreased profit on gas of £505. In this connection, of course, they must remember the additional amount paid under the head of rates and taxes, to which he had already referred. The total profits amounted to £8463, as compared with £8964 in the December half of 1899. From this had to be deducted interest on loans and income-tax £1537. against £1229, which left a net profit of £6926, as compared with £7735 in the corresponding six months. The amount required to pay the dividends now recommended was £8093; and it would therefore be necessary to take £1167 from the undivided balance on profit and loss account to make up the balance. The Board had decided to reduce the dividend and to take the sum mentioned from the undivided balance; and they could only trust that better times would soon come. Returning to the gas accounts, it would be seen that they had carbonized 4740 tons of coal, or a decrease of 14 tons. The average price had been £1 2s. 2d. per ton, as compared with 17s. 1d., or an increase of 5s. 1d. per ton. The gas made amounted to 52 million cubic feet, which was a decrease of 56,000 feet on the corresponding half year. The gas made per ton of coal was 10,971 cubic feet, which was a very good yield indeed. They had sold 45,460,000 cubic feet, or a decrease of 1,022,000 feet. This falling off might be partly owing to the mild weather they had had; but he believed the increase in price had also had something to do with it. The gas sold per ton amounted to 9591 cubic feet. The unaccounted-for gas was rather high—11·08 per cent. But this he thought would very soon be remedied. They had made 4514 chaldrons of coke, and sold 3155 chaldrons at 13s. 6d. per chaldron, as against 10s. 7d. The quantity of tar made was 52,140 gallons; and the average price at which it was sold was 1½d. per gallon. They had manufactured 44 tons of sulphate, which had realized an average price of £6 15s. per ton. The receipts from sales of gas had been £9636, or an increase of £574, which was owing to the higher price charged. The returns from residuals showed an increase of £468; while coal had cost £1194 more, and working expenses were £353 more. With regard to their wells, he believed there was plenty of water in the neighbourhood, and they were getting some of it at Potter's Bar. The sinking there was nearly finished; but there was heavy and continuous expense to meet. They dare not take the machinery away, and wait till they got their new engine, for fear of a breakdown at some of the other wells. Therefore they were paying a sum which, in the course of the year, came to a very large amount. He trusted, however, that in about nine months' time the new engine would be fixed, and that then they would be working economically. They were arranging for machinery to pump from this well 500,000 gallons per 24 hours; and this water would help the Company considerably. From the well at East Barnet they were getting 600,000 gallons per 24 hours, without any adits; but now they were beginning to drive adits. They hoped to have a good find of water when the adits were driven. It would be seen therefore that the Company had done all they could to look after the interests of the consumers of water. Of course that was the proper thing to do; and in looking after the consumers, they naturally looked after their own property. Their district was increasing; and though things did not appear very nice just now, he thought it was very probable that within the next twelve months the shareholders would have their dividend put up again. The Board reduced it now because it was wise to do so. They were able to pay their way and satisfy everybody except the proprietors. But after all, 8 per cent. was a very good dividend. He concluded by moving the adoption of the report and accounts.

Mr. A. H. BAYNES seconded the motion.

Mr. R. JOHNSON drew attention to the meagreness of the report, and suggested that this might be amplified on future occasions. It might be quite understandable by the Directors; but the proprietors should know something of the trials and difficulties of the Company, if the Board wanted their sympathy. He was glad the Chairman had alluded to the two wells, and that the Directors were a little more hopeful than they were a year ago. He would also draw attention to the question of gas for cooking, which was a very important item now. He had no doubt the Company sold a good deal of gas for this purpose; and he thought it would be wise if, in future, the Board would let the shareholders know what was in their minds on this and similar prominent subjects. Referring to the matter mentioned by him at the last meeting, he said no one could tell at present from the accounts how much money had been spent at Potters Bar and how much at East Barnet; and it seemed to him the figures wanted dividing up more. Then in the general balance-sheet, on the credit side the first item is "By capital account, balance at debit thereof (Account C)," £20,771. He would like to know how this money was going to be obtained.

The CHAIRMAN replied that, as regarded the £20,771 referred to, the fact was they had spent more money on capital account than they had received. That was why the new issue of shares was made. They were at present making calls which would reduce the £20,771 to about £4000. As to the wells, the Directors did not feel justified in saying what they were costing until the work was completed. Replying to another question, he said that, with regard to prepayment meters, they were doing everything possible, but the system was not taking very rapidly in the district.

The resolution was then carried unanimously.

On the proposition of the Chairman a dividend was declared at the rate of 8 per cent. per annum on the "A" and "C" stocks, 7 per cent. on the "B" stock, and £5 12s. per cent. on the "D" gas and water stocks, all less income-tax.

The retiring Directors (Mr. A. H. Baynes and Dr. J. W. L. Glaisher) having been re-elected,

Mr. GUYATT proposed, and Mr. JOHNSON seconded, the election of Mr. C. P. Crookenden as Auditor to the Company, in place of the late Mr. Hounsham.

This was carried unanimously; and Mr. CROOKENDEN briefly returned thanks.

The CHAIRMAN next moved, and Mr. BAYNES seconded, a vote of thanks to the Engineer (Mr. T. H. Martin); and this was carried.

Mr. MARTIN, in acknowledging the vote, said they had had a little bit of a struggle the last two or three years, with reference to water and to gas. With regard to the pumping generally, which cost them very much more for fuel than it ought, as soon as this difficulty was over, they would return to the old ways. As to Mr. Johnson's remarks, he said they waited for a job to be finished before they carried it to the capital account.

The CHAIRMAN, after proposing a vote of thanks to the Secretary and staff, said he would like to state that the Company had secured a site for a new well, if they should want it.

The vote was carried, and acknowledged by Mr. DREW and Mr. WRIGHT.

Mr. J. L. CHAPMAN, in moving a vote of thanks to the Chairman and Directors, said the shareholders ought to thank the Board for taking the "bull by the horns" and reducing the dividend when necessary.

Mr. JOHNSON seconded the proposal, and it was carried unanimously.

The CHAIRMAN having thanked the meeting, on behalf of himself and his colleagues, for the vote, the proceedings terminated.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

At the annual general meeting of the Barnsley Gas Company, the Secretary and Manager (Mr. W. W. Hutchinson) read a comparative statement of revenue and expenditure, in which the following were the principal items: Cost of coal, £9575, an increase of £1404; repairs, maintenance, and renewal of mains, an increase of £1356; total expenditure, £22,687, an increase of £2697. The amount of profit was £8039, against £8429—a decrease of £390. They sold 132,431,600 feet of gas last year, against 134,985,800 feet in 1899—a decrease of 2½ millions. The receipts were £21,404, against £21,812, or £408 less; public lighting was £1911, against £1883, increase £28; rent of meters £923, against £906, increase £17; discounts £606, against £1845, decrease £1239; coke £4488, against £3251, increase £1237; tar £1458, against £1255, increase £203; ammoniacal liquor £1021, against £1023; and sundries £58, against £54. The Chairman (Mr. E. G. Lancaster), in moving the adoption of the report, in which the declaration of the maximum dividends was recommended, remarked that the balance-sheet would have caused some little anxiety; but, fortunately, they had been able to pay the full dividends. Compared with the bulk of the gas companies in England, the result was very satisfactory. Coal had cost £1400 more, and this item would have been a great deal bigger had they not had favourable contracts over nine of the twelve months.

They had only experienced the increased burden of 6s. per ton during the last three months. From the returns of about 200 gas companies in England, he found that increases in price had been made as follows: 50 of them, 3d. per 1000 feet; 34, 4d. per 1000; 46, 5d. per 1000; 61, 6d. per 1000; and 31, from 7d. to 1s. per 1000. He thought they might congratulate themselves that they had been able to treat the consumers in a very different manner. With such abnormal prices of coal, no management could produce favourable results; but it was fair to assume that the prices would go back again. The receipts were very good. It was true they had sold 2⅛ million cubic feet of gas less. But last year they thought there would be a difference of about 12 million cubic feet, owing to the electric light; and no doubt it would practically be that in the end. They were of opinion, however, that there was a large field yet open for the consumption of gas, and particularly in the use of gas-engines for motive power. Alluding to the electric light, he proceeded to refer to a speech of the Chairman of the Corporation Electric Light Committee, who had told them that the success of the electric light was assured, and that the ratepayers would not be called upon to make up any deficiency. He (the Chairman) cordially agreed with this; and if it was only carried out honestly, he would not have one word to say. For his part, he repeated that the electric light was a beautiful, soft, convenient, but expensive light, and would cost twice as much as gas for lighting purposes; and if the rates were not brought into it, they had no right to complain. He pointed out that the Company paid £1358 for rates, representing one-sixth of the dividends paid, and claimed that they bore their full share of the public burden. With regard to the future, it was not particularly bright so long as coal was 6s. or 7s. per ton higher than usual. They could stand 2s. per ton; but 6s. took away everything. He hoped the result next year would be as favourable as that now reported; but all depended on the price of coal. The report was adopted.

At the annual meeting of the Barnstaple Gas Company on the 16th inst., the available profit shown was £5789, out of which the Directors recommended dividends of 10 and 7 per cent. per annum. The accounts presented were for the fifteen months ended the 31st of December last. In moving the adoption of the report, the Chairman (Mr. W. C. Rafaral) said the total revenue amounted to £12,334, and the expenditure to £9448; leaving £2886 as the profit for the fifteen months. This was a most gratifying result; and the Directors had decided to reduce the price of gas by 3d. per 1000 cubic feet, to take effect from April 1. The number of consumers on the books was 1127. The report was adopted; and, after some discussion, it was resolved to grant Mr. R. Ashton, the former Manager, a gratuity of £100.

At the meeting of the Bath Gas Company next Thursday, the Directors will report that the revenue account for the six months ending Dec. 31 shows a favourable balance of profit. The total receipts in that period were £46,740; while the expenses were £37,042—leaving a balance of £9698. The large increase in the price of coal and oil, referred to in the report for the half year to the 30th of June last, was nearly balanced by the increase in the gas-rental due to the advance in the charge. As coal is falling, the Directors express the hope that contracts will be renewed, at the proper time, upon such terms as will admit of a reduction in the price of gas. The increase in the consumption in the Michaelmas quarter was upwards of 9 million cubic feet; but, owing to the very mild weather between Michaelmas and the end of the year, this did not continue. The half year shows a rise of about 11¼ million cubic feet, or nearly 5 per cent. The revenue from the sale of coke was very satisfactory.

The annual report and statement of accounts of the Bodmin Gas Company have been issued, in view of the meeting to-day. The Directors record an increasing demand for gas last year; but, as might be expected, consequent upon the very high cost of coal, the profits have been lessened, notwithstanding the fact that the price was raised 6d. per 1000 cubic feet from Midsummer last. The revenue account shows that the income from the sale of gas amounted to £2662; meter-rents and other items bringing up the total receipts to £3803. On the expenditure side, coal cost £2057 and wages £405; and the total was £3339—leaving a balance on the year's working of £464. Compared with the previous year, the profits show a decline of £124, which will not permit of the usual dividend being declared. But, there being a balance of profit brought forward of £225, the Directors recommend the payment of the customary 8 per cent.

The report of the Cheltenham Gas Company shows that the net profit for the past year was £14,854, or £1004 more than is necessary to pay the interest on debentures and 5 per cent. on the ordinary stock. The gas consumed showed an increase of nearly 25 million cubic feet as compared with the previous year's total. The value of residual products was well maintained. The rental of meters was £2403—double the figures of six years ago. The penny-in-the-slot system has also expanded. Introduced in 1897, the hire of coin meters reached £100 in that year, and rose to £576 last year.

At the half-yearly meeting of the Colney Hatch Gas Company last Thursday, the report presented showed that there was an increase of 2·5 per cent. in the quantity of gas sold in the six months ending Dec. 31, as compared with the corresponding period of the previous year. The revenue was £10,248; the expenditure, £8043—leaving a balance of £2205. The net profit was £5147; and the Directors recommended dividends at the rates of 10, 7, and 5 per cent. per annum. After payment of these, there was left a sum of £3154 to the credit of the profit and loss account. The extra cost of working caused by the advance in the price of coals and other materials was met by the increase made in the charge for gas, and by the additional income arising from the better prices obtained for residual products. The Directors, in their report, pointed out that their policy in making only what might be regarded as the minimum increase in the price of gas had been fully justified.

The report of the Directors of the Gloucester Gas Company, which will be presented at the half-yearly meeting next Thursday, sets forth that the excessive price of coals considerably raised the expenditure in the six months ending Dec. 31, and materially affected the profits. The business, however, progressed satisfactorily; there having been again a good increase in the consumption of gas. This, combined with the advance made in the charge, and the higher prices received from coke, met to a great extent the extra outlay for coal; but, notwithstanding these increased receipts, the balance of revenue account shows a large falling off. The existing contracts for coal, which terminate on the 30th of June, are still at the high prices; but the Directors express the hope that the next will be made at a reduction. The net profit for the half year is £2656; and the Directors recommend the payment of the statutory 5 per cent. dividend upon the ordinary stock. This will require £4095; leaving an amount of £1439 to be taken from the undivided balance. The statement of accounts accompanying the report shows that the manufacture of gas cost £19,009, against £12,981 in the latter half of 1899; and the sales of gas realized £18,045, as compared with £15,600. The meter and stove rents were £1468, against £1220; and the residual products fetched £7334, or an increase of about £1650. The balance carried to the profit and loss is £3543, against £5415. The coal bill ran up to £15,298; and the coke sold realized £5377.

At the annual general meeting of the Hertford Gas Company last Thursday, the Directors reported that the profit on the revenue account for the past year amounted to £1764; and that the balance available for distribution was £1820. Out of this the Directors recommended that, after paying the dividend of 5¾ per cent. (less income-tax) on the new preference shares, dividends for the year should be paid at the rate of 8½ per cent. on the original shares, and 7½ per cent. on the new shares, both less income-tax. The payment of these would absorb £1463. The Directors pointed out that the Company, in common with others, had to purchase coal under the new contracts at a greatly increased price. Having, however, cleared off the balance of the suspense account, due to the renewal of the retort-house and coal-stores in 1896-7, and in view of the increasing output of gas, they felt justified, notwithstanding the heavy charge for coal, in making a further reduction in the price of gas. This was effected on the 1st of April; the price being reduced from 3s. 11d. to 3s. 9d. per 1000 cubic feet. The Chairman (Mr. E. Manser), in moving the adoption of the report, said the total increase in the cost of coal amounted to £673; but £238 had been recovered by the sale of residuals—leaving £435 net. The reduction in the price of gas was equivalent to £175; so that the two items made up £610, which had been met by gains due to further economy in working, to the growth of the business, and to the extinction of the suspense account. The increased output of gas was nearly 2 millions, due to the extra consumers. During the year 25 additional ordinary meters were fixed and 31 slot meters, with 50 extra cookers. The total number of cookers now on hire was about 170—a testimonial to their efficiency. The sale of gas per ton of coal used last year was 9168 cubic feet, against 8985 cubic feet in 1899; while the gas unaccounted for had been reduced to 7¾ per cent. from 8½ per cent. The balance from the profit and loss account last year amounted to £287; and after paying the dividends now recommended, it would be £356. The Directors had great hopes they would be able to maintain the rate of profit next year. Mr. Gilbertson seconded the motion; and it was carried. A vote of thanks was accorded to the Manager and Secretary (Mr. R. Watson), for the excellent results achieved.

The annual meeting of the Ipswich Gas Company was held on the 18th inst., under the presidency of Mr. G. A. Biddell, M.Inst.C.E. In moving the adoption of the Directors' report (noticed last week), the Chairman said it was very gratifying to them that they had been able to get through the past year without finding it necessary to increase the price of gas, and at the same time to earn the usual maximum dividends and add something to the floating balance. He found that about 28 years ago the price of gas in Ipswich was raised from 3s. 9d. to 4s. 3d. on account of an increase in the price of coal; and he thought the Company might congratulate themselves on being in their present enviable position. The main factor, undoubtedly, which had enabled the Directors to combat the tendency to raise the charge for gas had been the circumstance of their having had the benefit of the cheap coal on their old contracts, which carried them through the early part of last year, before they came upon the much dearer coal of the new ones. Then there had been the steady growth of the demand for gas. Last year they had an increase of 8 per cent., coming upon a gain of more than 10 per cent. in 1899 and of nearly 6 per cent. in 1898. This fine increase had indirectly brought another factor into play—viz., that the works had been kept going almost up to their maximum power of production, with a continuously greater demand for day gas. Their Engineer (Mr. J. T. Jolliffe), whose whole heart was always in the business, and his efficient willing staff, had been not unimportant factors in enabling them to go through the year so satisfactorily; and they were striving to bring about as good results in the current twelve months. Having dealt in some detail with the figures in the accounts, the Chairman made the satisfactory statement that, on a total revenue of £60,000, they had only the small sum of £21 as bad debts. He also mentioned that the increase in the users of ordinary meters had been 143, making a total of 3409; and of slot-meter customers 614, making a total of 4601. The increase in gas-engines was 8, making a total of 110. Of the £43,632 received for gas, 65 per cent. was from private consumers having ordinary meters, 23 per cent. from slot-meter consumers, and 12 per cent. from the public lamps. He next brought before the shareholders a few facts relative to the gas industry of the United Kingdom, and showed that in the year 1899 upwards of 13¾ million tons of coals were carbonized by 682 gas undertakings, and 11 million tons used by the railways. This brought out the singular coincidence that every mile of mains (27,000) was accountable for 500 tons of coals per annum; and the same quantity per mile was used on the railways, there being 22,000 miles of line. He closed his speech with some interesting historical particulars in regard to the progress of gas lighting at Ipswich, which are given in another column. Mr. F. H. Fosdick seconded the motion, and it was carried. The Chairman then proposed that a dividend at the rate of 12 per cent. per annum on the "A" stock, 9½ per cent. per annum on the "B" stock, and 9 per cent. per annum on the "C" stock be paid; making, with the interim dividend, 12, 9½, and 9 per cent. per annum on the respective stocks. Mr. W. Alexander seconded the motion; and it was agreed to. The services of the Directors, the Engineer and his assistants, and the staff generally, were then recognized; and the meeting closed.

At the recent half-yearly meeting of the Littleborough Gas Company, the usual dividend of 10 per cent. was declared. According to the balance-sheet, the receipts were £5231, against £4660 for the corresponding half of 1899—an increase of £571. This time last year,

the Directors had to report a decrease of nearly £230. The expenditure was £3640, against £2980; and the profits amounted to £1590, against £1679. The sum available for distribution was £3222.

The annual meeting of the Newmarket Gas Company was held on Monday last week. The Directors' report stated that the net profits for the year amounted to £3873, which, with the balance brought forward, made £4290. It was recommended that a dividend at the rate of 6 per cent. for the second half of the year be declared; making 6¼ per cent. for the year, and leaving £728 to be carried forward. The Chairman (Mr. Robert Stephenson), in moving the adoption of the report and accounts, said that the past year had probably been the most difficult in the Company's history; but they had held their own. The report was adopted.

At the recent half-yearly meeting of the Peterborough Gas Company, the Chairman reported that the increased price of coal had cost the Company £4200 on the year, while the local rates had been heavier than they had ever been before in the history of the Company. The Directors saw no fear of the output of gas being decreased owing to the introduction of electric lighting by the Corporation; but, at the same time, no hopes were held out for a reduction in the price of gas to consumers. The Company would in the near future have to consider seriously the question of calling up all the unpaid capital. The usual maximum dividends, averaging 7¼ per cent., were declared.

At the annual general meeting of the Redhill Gas Company on the 14th inst., the Directors reported that the accounts for the past year showed a balance of £5395 available for distribution; and they recommended a dividend at the rate of 9½ per cent. per annum, less income-tax, leaving £410 to be carried forward. An interim dividend of 4½ per cent. was paid in September; so that the balance would be 5 per cent. In moving the adoption of the report, the Chairman (Mr. H. Stenning) referred to the increase of more than 7 per cent. in the consumption of gas last year as compared with 1899, which he thought might be considered very satisfactory, looking at the mild season during November and December. He believed they might expect to have a further increase in the future. With regard to the electric light, which would soon come into operation in the borough, he did not think it would in any way hurt them. From all they could read of other places, it had not affected the consumption of gas one iota. In Croydon it had increased in spite of the electric light. In their district the light would, he might say, be the luxury of the few. He went on to refer to the high price of coal and the increased charge for gas, and pointed out that the shareholders had to bear with the consumers their proportion of the burden. The price of gas, however, had only been increased 10 per cent., while the cost of coal and oil had gone up as much as 30 and 40 per cent. He then passed on to refer to the progress of the Company, as shown by the fact that in 1861 they had only 65 or 70 consumers, whereas they had now more than 2000, and that the works (which are under the supervision of Mr. Douglas H. Helps) had increased from two benches of three small iron retorts to 100 large retorts. He also dealt with the various items in the accounts; concluding with the announcement that the Directors, on the advice of Mr. Corbet Woodall, were erecting a holder to contain a million cubic feet of gas. The report was adopted. At the close of the ordinary business, a special meeting was held, at which the Directors were authorized to raise further capital by the creation and issue of £15,000 of ordinary stock, under the powers conferred by the Company's Act of last session, and to borrow money in respect thereof.

At the annual general meeting of the Rugby Gas Company next Thursday, the Directors will again have the pleasure of reporting that the affairs of the Company are in a satisfactory condition, and the works (which are under the supervision of Mr. Charles Meiklejohn) in a high state of efficiency. The receipts on revenue account for the year amounted to £17,343, of which £11,925 was for gas supplied for public and private lighting, and £4274 was derived from the sale of residual products. The expenditure on the manufacture of gas was £9422, £7001 being for coals, as compared with £8500 in 1899, when the coal cost only £5503. The total expenses for the year were £12,458; and the balance carried to the profit and loss account is £4885, as compared with £5068 a year ago. The net amount available for distribution is £6726, against £6455; and the Directors will recommend a dividend for the six months ending Dec. 31 at the rate of 13 per cent. per annum, less income-tax; making with the interim payment a dividend at this rate for the year. This will amount to £2207. The Directors are fully justified in congratulating the Company and the consumers, as they do in their report, on being able to carry on the undertaking without increasing the charge for gas, notwithstanding the high price of coal—a satisfactory condition of things upon which their Engineer may likewise be felicitated; for with an extra outlay of about £1500 for his raw material, he has produced a divisible balance nearly £300 higher than that available a twelvemonth ago.

In the report which the Directors of the South Shields Gas Company will present at the annual general meeting next Thursday, they state that the receipts in the past year amounted to £79,261, and the payments to £63,828; leaving a profit of £15,433. After allowing £9338 for interim dividend and interest paid during the year, there is a net balance of £6094, with which it is proposed to pay a dividend of 4 per cent. for the half year; making, with the interim dividend of a similar amount paid in September, 8 per cent. for the year. In order to do this, however, it will be necessary to take £854 from the reserve fund. Coals cost £6677 more last year than in 1899. Coke and tar, however, realized £4854 more; and there was an increase of £1892 in the gas-rental. In order to encourage the sale of gas, the prepayment system has been introduced; and, judging from the large number of orders already received, good results are anticipated. Reference is made to the appointment of Mr. T. H. Duxbury, of Bradford, as the Company's Engineer, in succession to Mr. W. J. Warner resigned; and the Directors will submit to the shareholders a proposition in regard to granting Mr. Warner a retiring allowance.

The half-yearly statement of accounts and general balance-sheet of the Wolverhampton Gas Company shows a net profit of £8712, which, added to the balance brought forward, enables the Directors to recommend the payment of dividends of 3 per cent. upon the preference stock, 5 per cent. upon the consolidated stock, and 3 per cent. upon the new ordinary stock, less income-tax. They further recommend that £277 be placed to the credit of the reserve fund, £77 to the credit of the insurance fund, and £3363 carried forward. At the last meeting, authority was taken to increase the capital by the creation and issue of £30,000 of new ordinary stock. Of this amount, there was sold by auction, in October last, £12,300, the whole of which has been fully paid up.

At the half-yearly meeting of the Waltham Abbey and Cheshunt Gas Company last Friday, the Directors reported an increase of 10·43 per cent. in the quantity of gas sold in the six months ending Dec. 31; while the amount received for residuals was higher than it had been for some years past. The works and distributing plant (under the supervision of Mr. W. Bince Randall) were maintained in a condition of thorough efficiency. The accounts showed a revenue of £6077, against £5336 in the latter half of 1899, and an expenditure of £4418, as compared with £3731. The balance was £1659, while in the corresponding period it was £1455, and a sum of £150 was carried to the suspense account. The amount available for distribution was £2626; and the Directors recommended a dividend at the rate of 8 per cent. per annum on the "A" shares, and of 6 per cent. per annum on the "B" and "C" shares (less income-tax).

Water Companies.

The half-yearly meeting of the Leatherhead and District Water Company was held last Friday—Mr. John Boustead in the chair. The report stated that the receipts for the half year amounted to £2756, and the working expenses to £1707; leaving a profit of £1048. To this had to be added £798, the amount brought from the previous half year, making a total of £1847. Deducting from this sum £161 interest on debenture stock, there remained £1686 available for division among the shareholders. Out of this, the Directors recommended a dividend at the rate of 5½ per cent. per annum, which would absorb £924, and leave a balance of £761 to be carried forward. During the half year, 350 £10 shares (maximum dividend 7 per cent. per annum) had been issued, at an average price of £14 4s. 7d. per share. In the six months, 67 new services were laid on, making a total for the year of 115. Appended to the Directors' report was the report of the Engineer (Mr. F. S. Cripps). In it he said that the water supply during the past six months had been abundant, and the quality, as certified by the Analyst's reports, very satisfactory. An 8-inch main, about 2000 yards long, had been laid from Leatherhead to Ashtead, to meet the demands of this growing district. About 1000 yards of 3-inch mains had also been laid. The new drainage system now being carried out in Leatherhead and district will, when in operation, considerably increase the demand for water. This will probably necessitate some expansion of the Company's works. The Chairman, in moving the adoption of the report, said it would be noticed that the Company were making steady progress. Unfortunately as regarded some matters—more especially the cost of fuel—a larger sum had been expended than on former occasions; but at the same time the success of the undertaking in other ways had been such that the dividend had not been affected. The additional cost of fuel alone amounted to 17s. 3d. per million gallons of water more than in the corresponding half of the previous year; and there were also other increases to be met. He mentioned that, greatly to the regret of the Directors, Mr. H. Rokeby Price had severed his connection with the Board. Mr. Thomas Haynes, too, feeling the infirmities of age creeping upon him, had resigned the secretaryship; and his place had been taken by Mr. John Young. Mr. Haynes had been a most valuable servant of the Company for many years; and the Directors had made a small provision for him of £25 per annum. The report was adopted.

At the half-yearly general meeting of the Maidstone Water Company, last Thursday, the Directors' report and the statement of accounts were submitted. For the half year ended Dec. 31 the water-rents amounted to £5895, being a decrease of £22 as compared with the corresponding half of the previous year; and the accounts showed a sum of £3173 to the good. The Directors recommended the payment of a dividend, free of income-tax, at the rate of £5 10s. per cent. per annum on the 10 per cent. shares, and at the rate of £3 16s. 8d. per cent. per annum on the 7 per cent. shares of the Company. These payments would absorb £1229; leaving £1944 to be carried forward. It was stated that the work in sinking the well at Forstal was progressing. The iron cylinders had been sunk, and the boring had been carried to a depth of 185 feet, and was now in the strata yielding the water. It was proposed to carry it to a depth of about 225 feet. The revenue account showed total receipts for the six months amounting to £6058, including £5895 net water-rates; and the expenditure totalled up to £3136, including £2290 for maintenance expenses and £846 for management. There was a sum of £2922 to be carried to the profit and loss account; the balance on which was £3173, as mentioned above.

The annual report of the Directors of the Newcastle and Gateshead Water Company shows that the revenue of the Company continues to progress satisfactorily. The gross receipts for the past year amounted to £153,484. After deducting the working expenses, interest on debenture stock and loans, and the interim dividend paid in August last, there remains a balance of £53,464, which the Directors recommend to be appropriated as follows: To the payment of the dividend on the preference stock, £19,581; to the payment of a dividend after the rate of 9 per cent. per annum on the ordinary stock, making (with the interim dividend paid in August last) 8½ per cent. for the year, £17,477; to the payment of a dividend after the rate of £6 6s. per cent. per annum on the ordinary stock under the Act of 1876, making (with that paid in August last) £5 19s. per cent. for the year, £10,080; leaving to be carried forward £6326. The increasing demand for water necessitates continuous extensions of the works of the Company; and a large amount of capital was expended during the year. Contracts have been let, and considerable progress has been made with the construction of works foreshadowed in the last report—viz., the laying of a 33-inch trade main from Whittle Dean to Newcastle, two 30-inch main pipes through the city to the proposed reservoirs of Byker, and the construction of a new aqueduct from Hallington to Whittle Dean. A large outlay was also incurred during the past year on ordinary street extensions and service-pipes. The new impounding reservoir, at Catcleugh, made satisfactory progress during the year. All the reservoirs are now quite full; the total water in store being 3060 million gallons. The pipes laid during the year reached a total of 41,078 yards, or 23 miles 598 yards.

GREENOCK CORPORATION GAS UNDERTAKING.

The Proposed Reduction of Illuminating Power.

An occasional contributor sends us the following observations upon the above subject :—

Since Mr. Ewing has been thoroughly installed as Gas Engineer and Manager at Greenock, he and a number of members of the Gas Committee and the Police Board have laboured hard to get the illuminating power of the gas legally reduced. His argument is that, by using superior burners of the latest and most improved type, as much, or about as much, light will be obtained from 15-candle gas as from 25 or 20 candle. If Greenock gas were reduced from the standard of 25 candles to 15 candles, the comparison would be even more startling than the data given by Mr. Dibdin in his recent paper read before the Society of Chemical Industry.

Mr. Ewing persuaded his Committee to go in for a Provisional Order asking powers to reduce the illuminating power ; and at the last meeting of the Police Board, Provost Black brought up the matter. The Gas Committee, he said, had carefully gone over the items suggested by the Town Clerk, and they were now able to give their London agents definite information as to what they intended to embody in the Order. A very important clause was that dealing with the gas undertaking, especially with regard to the proposal to obtain authority to reduce the illuminating power of the gas. This matter had been fully discussed in Committee ; and he now moved the adoption of the minutes, except the part referring to the gas undertaking, which would be moved by Bailie Campbell, the Convener of the Gas Trust. Treasurer Swan seconded the Provost's motion, and it was carried. Bailie Campbell then moved the adoption of the paragraphs separately referring to the gas undertaking, and said the first of the recommendations was that additional borrowing powers should be applied for to the extent of £100,000. This was undoubtedly a large sum ; but he trusted to be able to convince the Board that it was not one beyond their requirements. Their borrowing powers were exhausted, and works of considerable magnitude at present in progress, together with others, the inauguration of which became yearly more urgent, would compel the Board to make provision for a large capital expenditure. The total required was approximately £70,000 ; and if to this sum they added the amount overborrowed, they came almost within sight of the £100,000 named by the Committee. The second paragraph related to the application of possible surplus revenues. At present, when a surplus resulted, the practice was to carry it to the credit of general purposes ; and when a deficit occurred, to leave it to be met by subsequent earnings. In this arrangement there was manifestly a measure of unfairness, as gas consumers, who were only a section of the community, were thereby deprived of the benefits accruing from good results, of which they were the sole contributors, and were left to endure and to make good any bad results which might ensue. The last paragraph, with regard to the proposal to reduce the illuminating power of gas from 20 candles (the present minimum) to 15 candles, was, perhaps, the one admitting of most variety of opinion. It was well, however, to distinguish between a proposal to reduce and one to obtain powers to reduce. It by no means followed that, because the Board succeeded in obtaining the powers intended to be asked for, they would proceed to exercise them. This would depend upon the future developments and changes in the methods by which gas was utilized. In the meantime, the Committee merely deemed it prudent, in view of most radical changes which might soon occur in that respect, to be in a position to avail themselves of them, as other communities might be expected to do, when they arrived.

At this stage the Bailie made a long reference to Mr. Dibdin's arguments, and the data on which they were based, and went on to say that the most potent reason for seeking to obtain such power for themselves was that of the inexorable necessity. It was a fact that the available supply of such rich coals as were necessary for the production of gas of a high illuminating property was approaching exhaustion in Scotland, and so much was this the fact that authorities were agreed that were the city of Glasgow alone to decide upon manufacturing gas of high standard quality there would not be sufficient material for the purpose. He ventured to say that the present proposal might be only a prelude to the Gas Department undertaking in the near future the supply of incandescent burners to all consumers of gas. He said in the near future, because the present high prices of the mantles was prohibitive of such a policy in the meantime. The whole history of these incandescent mantles had been one of gradual reduction in price, and undoubtedly progress towards this result would be considerably accelerated by the expiration of existing patents. When it did arrive, he made bold to say that no policy would be a safer, a more popular, or a more successful one financially than for the department to supply incandescent burners and mantles free to consumers. He had heard a fear expressed by consumers who used gas as a motive force that the reduction in the illuminating standard would adversely affect the horse power which they obtained from their gas-engines. His information on this point was that no such apprehension need be entertained. The force derived from gas was in no important way dependent on its illuminating power, but in all essential respects on its explosive properties. He then proposed that the borrowing powers should be applied for to the extent of £100,000 for renewing the plant at the Inchgreen Gas-Works, and for supplying new mains for the distribution of gas.

Mr. Mitchell, late Convener of the Gas Committee, proposed, as an amendment, that powers should be asked for £70,000. He very shortly supported his proposition ; but he found no seconder, and the motion was carried.

Bailie Campbell thereupon moved the adoption of the following clause : "The Sub-Committee have considered the clause as to the application of revenue contained in the Gas Act, and are of opinion that the direction that any surplus is to be carried over to the general purposes of the Police Board should be so modified as to enable the Board, out of the profits of the undertaking, to establish, in their discretion, a contingent fund to make good any deficiency of gas revenue or extra expenditure on works which might be required." The motion having been carried, he moved the adoption of the third clause, which had reference to incandescent lamps, and it was carried.

DEVONPORT CORPORATION AND THE GAS-WORKS.

A Meeting of the Devonport Town Council was held last Thursday to confirm the resolutions passed at a previous meeting authorizing the promotion of a Bill by the Corporation for the purchase of the gas-works, and also the opposing of the Bill promoted by the Gas Company for an extension of their capital.

The Mayor (Mr. H. J. Harman Graves), who presided, moved a resolution sanctioning the promotion of the Corporation Bill.

Mr. W. Hornbrook, Ex-Mayor, seconded the motion.

In the course of the discussion to which the proposal gave rise,

Alderman C. H. Stanbury said he should be sorry to see the matter fought out to the bitter end between the Corporation and the Company. It might lead to an amicable settlement if the Corporation dropped the personal charges—such as the statement that had been made that "immediately the Company got their Act they commenced to rob the gas consumers." Perhaps it looked like that to some people ; but they would not arrive at an amicable settlement by using such language.

Alderman J. B. James, referring to the allegation that the Company have been paying 10 per cent. dividends on 3000 shares only entitled to 6 per cent., asked whether the Company could now claim as a right what had been established by custom. If not, the town ought to acquire the works on the capitalized value at 6 per cent., and what had been paid in dividend over and above this amount would be a claim against the Company.

The Town Clerk said that, as the Company would endeavour to persuade Parliament to condone this over-payment of dividends, he wanted to say as little about it as possible. In the Corporation Bill it was provided that in fixing the compensation to be paid to the Company, regard was to be had to any sums which the Company had illegally distributed to their shareholders. The Company admitted receiving the maximum dividend for some forty years ; and as the overpayment came to £600 a year, it must amount in the aggregate to quite £18,000.

The resolution, on being put to the meeting, was carried by 34 votes to one.

Alderman Brooning, who recorded the adverse vote, said he did not desire to be the only dissentient, and though he felt bound to protest against the manner in which certain gentlemen wished to hurry this matter, he asked that his vote might be recorded for the resolution.

A resolution confirming the decision of the Corporation to oppose the Company's Bill was then passed without dissent.

EARLY DAYS OF GAS LIGHTING AT IPSWICH.

As mentioned in another column, an interesting feature of the address of the Chairman of the Ipswich Gas Company (Mr. G. A. Biddell, M.Inst.C.E.) at the recent annual meeting was an account of the introduction of gas into the town. Mr. Biddell had previously reminded the shareholders that the Nineteenth Century had been called the "Age of Gaslight ; " and he suggested that possibly the present one would be known as the " Age of Gas Heating "—this idea being encouraged by the constantly increasing demand for day gas for domestic purposes and the production of power. He then went on to show how Ipswich had early availed itself of the new illuminant ; his remarks being as follows.

In November, 1814, the question of lighting the public lamps in Ipswich was mooted, but was considered too expensive ; and nothing was done. In April, 1817, the first gaslight in our town was shown on the premises of a Mr. Blackley. The question of lighting the principal streets was then under consideration by an influential number of the inhabitants, who formed a Committee, and sent Messrs. Cubitt and Hooker to London to get information about gas and its production, and to report. In May, 1817, a public meeting was held at the Town Hall, when the report of Messrs. Cubitt and Hooker was read, and highly approved. These gentlemen had seen and examined the patent apparatus of Messrs. Stone and Co., and considered it the most suitable and best. In consequence of this report and meeting, it was agreed that a Company should be, and was, immediately formed, with a capital of £3000, in 60 shares of £50 each, to establish a gas-works. A suitable site for starting and conducting the concern was obtained on the premises forming part of Ransomes' Foundry, in St. Margaret's parish, within a few yards of the site of our offices. Three relatives of the original subscribers to this first Company are here to-day, and are represented by the three—A (Alexander), B (Biddell), and C (Corder) —oldest members of your present Board of Directors. On Friday night, the 2nd of January, 1818, for the first time, most of the shops near the gas-mains just completed in Carr Street and Tavern Street, were lighted and illuminated by gas. The effect and appearance was said to be " brilliant and beautiful." The population of the town at that time was about 14,000. The first burner was lighted by an enthusiastic and excited person, by a twisted £1 note. I knew this gentleman when he became an old man, more than fifty years ago.

On the 20th of October, 1820, a public meeting was held at the Town Hall, for the purpose of taking into consideration the means of lighting the town with gas. It was resolved—" That it will be highly advisable to introduce gaslight for general use in the town, and to establish a joint-stock company under an Act of Parliament ; and that a public company be formed of subscribers as shareholders, in shares of £10 each, and that proper application be made to Parliament for an Act, to incorporate the joint-stock company." The general estimate for carrying out the concern amounted to £12,500. On the 8th of December, 1820, a large public meeting was held at the Town Hall, which was rather stormy. The discussion was chiefly as to removing the gas-house in St. Margaret's to a more remote part of the town, with the result that the works were removed to near the banks of the river, at the south-east side of the town, on the site where they are to this day. The first Act for lighting with gas the town and borough of Ipswich received the Royal Assent on May 28, 1821. In July, 1822, the Paving and Lighting Commissioners accepted terms of agreement with

the Gas Company for the general lighting of the town with gas. The new works were in fair working order by the spring of 1822; and I have here, together with a copy of the first Act, a copy of the first report and accounts up to the end of 1822, showing a profit of £450 for the first nine months, also a list of shareholders. There is a portrait on the walls of these offices of William Cubitt, who was the moving spirit in the first establishment of gas-works in our town, as well as Secretary and Engineer. He will rank in East Anglian biography as one of its notable worthies. He carved out his own career and fortune. He worked as a millwright at a bench in the old foundry near this very spot; and he was appointed Engineer of the Reading Gas-Works, because he had done so well at Ipswich. He was Chief Engineer to the South-Eastern Railway, and the southern portion of the Great Northern Railway, as well as to several foreign railway companies. He was Chief Engineer to the Commissioners of the Great Exhibition of 1851, and was knighted after its close. We are indebted to that old class of working millwrights, of whom William Murdoch and William Cubitt were very good specimens.

LONDON COUNTY COUNCIL AND OPENING ROADS.

At the Meeting of the London County Council last Tuesday—Mr. W. H. Dickinson in the chair—a long report from the General Purposes Committee, dealing, among other things, with the opening of roads and streets, was presented. On the 27th of March last, the Council authorized the Committee to arrange for a conference with representatives of the City Corporation and the then Vestries and District Boards, to consider a number of matters relating to streets and the traffic therein set out in a resolution passed by the Council on Dec. 20, 1898. In the course of their report, the Committee said: "Several Local Authorities have urged that some remedy should be found for the frequent opening up of public ways by water, gas, electric light, and telephone companies. The conference considered that this constitutes a great evil, and is the occasion of much annoyance to the public generally, and frequently of loss to tradespeople, and therefore should, as far as possible, be prevented. It was suggested that the Local Authorities should have more power of control, and that, when practicable, subways should be constructed under the streets, in which the pipes, &c., could be laid. The following resolutions were passed —'That this conference is of opinion that in all new leading thoroughfares subways should be constructed in which the water and gas mains, pipes, &c., could be placed.' 'That this conference is of opinion that the time has arrived for concerted action on the part of the Local Authorities of the Metropolis to remedy the inconvenience, annoyance, loss of time, and money now caused by the operations of the gas, water, telephone, and electric lighting companies, in laying down, renewing, maintaining, and repairing their mains, pipes, services, and wires.'" The Committee recommended that these resolutions should be referred to the Improvements and Highways Committee for consideration and report. Earl Russell remarked that the breaking up of the streets for the purpose of putting pipes and wires under them was becoming a very burning question; and he expressed the hope that, when the Committee dealt with it, they would consider what legislation would be necessary. Concerted action on the part of the Local Authorities, which was recommended in the second resolution, would be useless without fresh legislation; and the provision of subways, as proposed in the first resolution, would also be useless without powers to compel companies to use them. He suggested that the best way of remedying the inconvenience would be to make it touch the pockets of the companies opening the streets. He believed there was a feeling on the part of many of the companies that it was cheaper to break up the streets and restore them than to use the subways and pay rent for their occupation. He suggested that provision should be made under which a company would be required to pay a certain sum per square yard for every 24 hours during which a street was open. If this rule were applied to each company opening the streets, it would have a most beneficial effect in expediting the work. There would then be no necessity to pass resolutions ordering them to do the work continuously night and day. The money obtained could be used for the maintenance of the streets and the benefit of the public. The recommendation was approved.

City of St. Petersburg New Water-Works Company, Limited.—The report of this Company shows that, after providing for interest on the debenture debt, the net profits are £5585. An interim dividend of 5s. per share was paid in September last; and the Directors recommend that a further dividend of 5s. 6d. per share be paid; that £300 be placed to the reserve fund; and that the balance, £54 18s. 2d., be carried forward. During last year, the remainder (£5900) of the "A" debentures has been paid off.

A Ducal Water Scheme.—The Bakewell Rural District Council recently submitted to an Inspector of the Local Government Board a water-supply scheme estimated to cost £17,500. The Duke of Devonshire, who is personally interested in the matter, has since been looking into it; and, through an engineer whom he consulted, he submitted an amended scheme, whereby a saving of £2000 might be effected. The Council have decided to again approach the Local Government Board, in order to obtain their views on the two schemes.

A Year's Gas Trading at Bingley.—Reporting upon the working of the gas undertaking during the past year, Mr. Gatecliff last week informed his colleagues on the Bingley District Council that the gas made amounted to 98,048,000 cubic feet—an increase of 3,546,000 cubic feet on the previous year; while owing to a saving in leakage, the actual sales had exceeded by 4,867,400 cubic feet those of the previous year. The receipts amounted to £12,498; showing an increase of £1206. The quantity of coal carbonized was 10,302 tons; and the extra cost of coal, compared with the previous year, was £2013. The net profit was £1334; and this the Gas Committee recommended should be carried forward to the current year's profit and loss account. The statement was approved.

ALLOCATION OF GAS PROFITS IN MANCHESTER.

Alderman Gibson's Motion Defeated.

At the Meeting of the Manchester City Council last Wednesday, the long-deferred discussion on Alderman Gibson's motion with respect to the allocation of gas profits was taken. This proposal, it may be remembered, was brought forward at a meeting held on the 19th of December last, and was to the following effect: "That, in the opinion of this Council, the present system of subsidizing the rates out of the profits of the gas undertaking is wrong in principle, unjust in practice, inimical to the best interests of the ratepayers, and ought to be discontinued."

Mr. PLUMMER, in resuming the debate, said this was one of the most important subjects that had been brought before the Council for a long time. He was in rather an embarrassed position, as it was not pleasant to find oneself opposed to Alderman Gibson, whose work on the Gas Committee entitled any opinion he might utter to their very careful and deliberate consideration. Notwithstanding this, however, he must say that he did not agree with him on the question under discussion. Taking first Alderman Gibson's statement of the case, they had the remark that it was his object to benefit both gas consumers and ratepayers alike. There was a distinct issue on this point. They might give the £50,000 to the ratepayers or the gas consumers, but not to both. They could not by any process benefit both alike. Alderman Gibson further admitted that, if raw material advanced, the manufactured article must be raised in price. Well, this was precisely the position in which they found themselves when they put up the price of gas 3d. per 1000 cubic feet, not with the idea of extra profit, but simply to maintain the *status quo*. The rise in raw material, therefore, justified the action of the Council in this respect. If they compared what had been done in other towns in consequence of the enhanced cost of coal, they would find that Manchester had taken up a very moderate position. Leeds, for example, had raised the price of gas by 4d. per 1000 cubic feet. Alderman Gibson said he was not a gas-at-cost-price man, because the works were the property of the ratepayers, and the ratepayers should have a fair profit. Further, there was the statement that it was unfair to make one portion of the community bear more than their fair share of the public burden. In their system of rating, there were so many anomalies that he ventured to think it was impossible to adopt this as a practical truth. To take one illustration only, a man had to pay a School Board rate although he might have no family, or send his children to a school not under the Board. To bring forward an assertion of this sort as an argument was, therefore, misleading. Even, however, admitting the statement, it did not apply in the slightest degree to the present case. Gas was not a burden; it was a commodity. They did not force a man to take gas; but they compelled him to pay his rates. He only paid a certain sum for the gas he actually consumed; whereas everyone had to pay the rates. The parallel, therefore, failed. Alderman Gibson stated that, by the recent rise in the price of gas, 80,000 persons suffered, and only 20,000 benefited. This, he thought, was exceedingly wide of the mark. He should rather take the opposite view, and say that 80,000 persons benefited and 20,000 suffered. He did not think it correct that the 3000 ratepayers who used the electric light benefited at the expense of the gas consumers. The man who took the electric light paid dearly for his "whistle." The pith of the question was that the percentage of profit made upon the capital utilized in the Electrical Department was at the present time very little less than upon that of the Gas Department; and they must remember that while gas was an established institution, electricity was in a transition state. As to a certain amount going into the pockets of the landlords, he had never known that a reduction in rates resulted in an increase in rents; the reverse was usually the case. Alderman Gibson's main contention seemed to be that, if they had applied the profits in extending the gas-works, they would not have had to borrow. This would be admitted; but, on the other hand, every penny of the money they had borrowed and put into the gas-works was there yet. It was not lost. Then the money handed over to the city fund had been applied to the improvement of the city in general. Either the improvements would not have been made, or they would have had to borrow money to make them; and they represented a wise and judicious expenditure of the profits from the gas-works. It was perfectly true that if they had left all the money in the gas-works, they would now have been able to supply gas practically free of charge; but this was simply equivalent to saying that a railway company, if they paid no dividends, could afford to reduce fares. There was no force in the argument. They had put 3d. per 1000 cubic feet on the price of gas strictly on account of the rise in coal, for which they were not responsible. Even with this advance, they had gas at the lowest level it had reached up to 1895. Having reduced the price then, they were now compelled to raise it, to maintain the *status quo*, without any idea of extra profit. The principles which ought to guide them in this question were laid down by Sir Joseph Heron in a report he had drawn up more than twenty years ago. He stated that it was the obvious duty of the Council, as trustees of the gas-works property, to secure, by the sale of gas at a fair market price, a reasonable return for their capital, or, in other words, upon the value of the property. Admitting this principle, he could show that they were not transgressing it in any way, but were simply seeking to obtain a fair return for the money expended. The city fund received £52,000 from the gas-works; but it paid £45,000 to the gas-works for street lighting; so that there was only a surplus of about £7000 actually received by the city. The gas-works were therefore only producing a very moderate return to the ratepayers. The total property and assets of the undertaking were £2,382,396 on March 31, 1900; and after working the concern and paying all charges and expenditure, they got a return on the capital of £149,051, which represented about 6¼ per cent. on the money invested. This, he maintained, was not unreasonable. Out of this amount, they paid £38,401 in interest on unpaid capital, £36,686 to the sinking fund, £52,000 to the city fund, £1758 to the suspense account, and £20,206 to the contingent fund. The gas-works undertaking, as he had said, was valued at £2,382,396. The liabilities were £1,255,562, which made a difference of £1,126,834. This belonged to the ratepayers, and,

invested at 3 per cent., would bring in over £30,000—a considerable proportion of the £52,000. He thought, however, Mr. Gibson would agree with him that they could sell the gas-works for a sum which would bring in the full £52,000; and he must remind them that they had not always got this amount from the works. He hoped, in conclusion, that Alderman Gibson would not succeed in convincing the Council in favour of his proposal. He recognized most heartily the good work Alderman Gibson had done so unweariedly for the city; and he would urge him and his Committee to strive to maintain the works in efficiency by helping to reduce the cost of production to the lowest point. There was good work to be done in this direction, calling for the exercise of their best faculties; and he hoped that in this work Alderman Gibson would meet with still greater success in the future than he had achieved in the past.

Dr. DREYFUS said Alderman Cibson had stated that he did not know what a fair market price for gas would be.

Alderman GIBSON (interrupting) said he had a definite opinion on the point. He had simply put the query as to who was to decide the question.

Dr. DREYFUS (proceeding) remarked that a fair market price was the average of the charges made by the neighbouring authorities for an article as nearly as possible like that which they themselves were supplying. Taking the statistics for 1899, he found that Manchester supplied gas of greater candle power, and at less price, than that furnished in Bolton, Oldham, and Salford, three of the principal neighbouring boroughs, He had before him a list of the prices at which gas was sold by corporations, and also by private companies, in 1899; and these showed that Manchester consumers paid less for their gas than the consumers in many of the other corporations, and much less than those depending upon private companies. Last year, owing to the great rise in the price of coal, advances had been made in the price of gas pretty nearly all over the country. He had a list of 34 gas undertakings which had raised the price last year; and of these 11 were supplying gas at a lower, and 15 at a higher price than that levied in Manchester. He thought, therefore, they were not charging more than a fair market price; and he considered it a right principle for the gas, as for other departments of the Corporation, that any profit resulting, after maintaining the undertaking and fixing a fair price for the article, should go to the benefit of the ratepayers generally.

Mr. LAMBERT said Mr. Plummer's speech was an admirable one, and his figures generally sound; but he had fallen into one or two slight errors. Gas was not only a commodity. To consumers in works, and in very many cases to the ordinary consumers, it was an absolute necessity. Then again Mr. Plummer had observed that it was impossible to benefit both the ratepayers and the gas consumers. He did not agree with this statement; but he did agree that the ratepayers should have a reasonable return on the money invested. To his mind the question narrowed itself down to whether the ratepayers were getting more than a reasonable return upon the amount invested. The percentage of profit—6¼—mentioned by Mr. Plummer was calculated, not upon the amount invested, but upon the value of the works and property. This to his mind was the sole point—whether it was right to take a percentage of profit on the value of the works or only on the amount invested. They were two different things; and the interest on the amount invested was not 6¼ but about 12½ per cent. The question was whether the ratepayers ought to receive interest on the amount invested only, or on the value of the property. What he ventured to suggest was that, when an ascertained profit had been made, a certain amount should be handed back to the ratepayers in reduction of the rates, and the balance could be carried to the credit of the gas consumers to reduce the price of the commodity. A distinction should be drawn. The whole of the profits should not go to the reduction of the rates; but a fair proportion should go in this way, and the residue should help to provide a contingent fund and reduce the price of gas.

Mr. HALLIDAY expressed the opinion that gas ought to be supplied at cost price, subject to the payment of all liabilities, and the maintenance of a reserve and contingent fund, which could be drawn upon in case anything happened, without the necessity of applying to the ratepayers There seemed to be an idea that the ratepayers had contributed something towards the building up of the gas-works; but this was not the case. The consumers had not only paid for their own works and the street-mains, but had continually handed over to the Corporation moneys for improvements. The increase in the price of gas weighed unfairly on the poorer classes; and the landlord benefited thereby. In justice to the small shopkeeper and the industrious poor, he thought they should not seek such an enormous profit on the gas supply of the city.

Mr. ASHTON said it appeared to him that the consumers of gas might be divided into two classes—the ordinary consumers, to whom, he believed, the present price was fair and legitimate, and the extraordinary consumers, who burnt a large quantity of gas. He had received a letter from a constituent, in which the writer stated that the advance of 3d. per 1000 cubic feet was equal, in his case, to an increase of 2s. 6d. in the pound on the rates. In a case of that kind, he thought they would all admit there appeared to be some hardship inflicted on the consumer. He suggested that consumers of this description might receive some sort of rebate—say, 1d. per 1000 cubic feet.

Mr. T. SMETHURST remarked that they had been fortified by Acts of Parliament innumerable in what had been done in the past; and Sir Joseph Heron's report clearly laid down the principles by which they should be guided in the matter. As to the question of a fair market price, he found from figures supplied by Mr. Carter, of Preston, for the years 1900-1, that out of 72 cities and towns only 25 charged less for gas than did Manchester. Surely, then, they could see that they were supplying gas at a fair market price; and if they could do this and still make £50,000 profit, it ought to go to the relief of the rates. He did not see the force of Alderman Gibson's contentions. Taking a 5s. house, assessed at £11 a year, and assuming that the £52,000 was not given to the city fund, but 4d. in the pound was put on the rates, this meant 3s. 8d. in the year. Supposing the occupier consumed 20s. worth of gas per annum, a 3d. advance meant 2s. a year more; so that if they adopted Alderman Gibson's plan, and increased the rates, he would lose 1s. 8d. It was certainly not the poor people who would suffer by the advance in the price of gas.

Alderman RICHARDS said, taking his own case as a Manchester tradesman, it would cost him more if Alderman Gibson's plan were adopted than it did with an advance in the price of gas. He thought the present charge was not excessive.

Alderman GIBSON, in replying on the discussion, said he had never known a question of such importance so weakly debated in the Council. The whole of the criticism had been absolutely outside the proposition he had made. He had said that the allocation of gas profits to the reduction of the rates was wrong in principle. There had not been a single speaker who had said it was right. He had declared it was unjust in practice. No one had said it was not unjust. He had also said it was inimical to the best interests of the ratepayers; and although Mr. Plummer had remarked that he did not agree with the statement, he had brought forward nothing to prove that it was incorrect. As to the rise in material affecting the price of gas, he had previously stated that they could have paid their interest and sinking fund, kept up the requisite repairs out of revenue, and yet handed over £20,000 to the city fund, without increasing the charge for gas. This being so, he could not conceive how anybody could say they were compelled to raise the price. This had been done, not because of the increase in the cost of raw material, but because they wanted to give the ratepayers the £50,000. He would also remind them that the valuable works they had to-day had been presented to the citizens, and paid for out of the pockets of the gas consumers themselves. The works had never cost the ratepayers a farthing. The whole of the works had been paid for out of the profits of the gas undertaking. They certainly belonged to the ratepayers; but still, when they considered that they had not cost the ratepayers a farthing, and that they themselves could only get about 3½ per cent. for their own money, was it not rather a Utopian idea to think they should continue to have 6¼ per cent. from the gas-works. Mr. Plummer had said that they got £50,000 a year, but returned £40,000 for street lighting. Quite true. But if the Gas Department did not get this £40,000, they could not pay the £50,000; so that it was a *quid pro quo*, and as broad as it was long. On the question o fa fair market price, his view was that it was the price that they could get for their own commodity in their own district, consistent with not allowing their business to be taken away from them by any competitor; and the argument based on comparisons with the price of gas in other towns was fallacious. With regard to Sir Joseph Heron's report, there was one principle he enunciated that was as sound now as at the time the report was prepared. Assuming that gas was sold at a fair market price, Sir Joseph said that the exigencies or requirements of the Corporation, be they great or small, ought not to affect the charge. Notwithstanding, however, that gas could have been sold at a fair market price, provision made for interest, sinking fund, &c., and £20,000 handed over to the rates, they had raised the charges because they thought some exigencies had arisen, which, real or fancied, ought not, as Sir Joseph Heron had stated, to affect the price of gas. In conclusion, he might express the opinion that it was impossible to overestimate the value of cheap gas to a large community; and every encouragement should be given to its production and use. He wished them, in voting, to put away the old prejudice and the antiquated fallacy of "relieving the rates" out of the gas profits, which in reality, as no one had attempted to deny, did not relieve the ratepayers. He wanted them to benefit the consumer and the ratepayer alike, so that their gas industry should stand on its own merits—making gas as cheaply as possible, paying all its own expenses and liabilities, and being a burden to none, but a "boon and a blessing" to all.

The vote was then taken; and the result was that 7 members held up their hands in favour of, and 54 against, Alderman Gibson's motion.

ELECTRIC LIGHTING NOTES.

According to a letter by Mr. H. A. Mavor in the "Glasgow Herald," there are now 1680 arc lamps in use for lighting the streets of Paris.

Tenders for the extensions of the electrical plant, at a cost of about £5900, were accepted at the meeting of the Tynemouth Town Council last Tuesday.

The Hanley electric lighting undertaking is improving its position. Alderman Hammersley has told his fellow councillors that (subject to audit) the works made during the past year £3630; and, after paying interest and sinking fund, there will be a balance of £330.

Owing to the adverse result of the polling at Edmonton and Enfield on the subject of the East Middlesex Electricity Bill, to which reference was made in last week's "Notes," Wood Green and Southgate have withdrawn from the proposed joint undertaking, and it has consequently been abandoned.

The profit on the electric light undertaking of the Huddersfield Corporation amounted to £110 last year, as compared with £2828 for 1899. The increased price of coal and the additional cost of the maintenance of the works are two items which account for the shrinkage in the profits. The Council last Wednesday agreed that the £110 should be transferred to the depreciation and contingencies account.

Some references have been made in these "Notes" to the official changes in the Electric Lighting Department of the Manchester Corporation; and it may therefore interest readers to learn that the Electrical Engineer who has been appointed to succeed Mr. Wordingham is Mr. Gustav Metzger, who occupies a similar position at Bath. From Bath to Manchester is a big step. Mr. L. D. Price, of the Central Electric Railway (London), is to be assistant to Mr. Metzger.

The Public Lighting Committee of the Grimsby Corporation have resolved to commence street lighting by electricity after March 31—that being the end of the Corporation financial year. Official information to this effect is to be sent to the Gas Company. The Committee, however, will not yet say absolutely how many gas-lamps will be dispensed with. Their only care seems to be to make a convenience of the Gas Company in the present stage, and at the same time to advertise their own commodity as much as possible.

The Pudsey Town Council have scheduled in their Provisional Order the greater portion of the town for electric lighting purposes; but their Consulting Engineers say it would be an absolute waste of money to

lay the mains throughout the whole of the streets scheduled. They recommend a scheme which would cover the populous parts of the town, and suggest that the Council should insert in the proposed Order an amended list of streets. They advise a generating plant large enough to supply 10,000 lamps of 8-candle power, and estimate the cost at £19,552.

"The sudden failure of the electric light at Sunday evening services in Sheffield places of worship," said a writer in the "Sheffield Independent" last Thursday, "is becoming such a frequent occurrence that people, I suppose, regard it without annoyance. Otherwise I fancy the papers would have heard before to-day of the darkness which suddenly enveloped two, if not three, congregations of worshippers at Attercliffe on Sunday evening last. Why these awkward incidents occur is a mystery which the public have never yet been able to fathom. The Electric Supply Department seems to go on the principle that a stoppage concerns nobody but the one person, being a customer of theirs, who cares to make a formal complaint; and to him they give a more or less technical explanation that leaves him little the wiser. If occasional stoppages are inevitable incidents of electric lighting on the grand scale, then let the public be so informed. Then they will more generally than is now the case guard themselves by retaining their gas-fittings when they give up gas for electricity. The congregation of Zion Chapel, Attercliffe, who had not taken this precaution, on Sunday last had to adjourn to the schoolroom before they could continue and conclude their service."

The accounts of the Electricity Department of the Liverpool Corporation for the past year give the total receipts at £109,814, including £72,055 for the sale of current for private lighting and power, £1764 for street lighting, and £30,596 for current supplied to the Tramways Department. Generation expenses stand for £42,765; the cost of distribution is £3229; management expenses are £8536; and rent, rates, and taxes, £6707. After meeting special charges (£1055) and allowing £44 for bad debts, £47,478 is carried to the net revenue. Interest absorbs £2148, and the sinking fund instalment £17,833; and the balance (£3497) is transferred to the renewal fund. The total capital expenditure at the end of last year amounted to £1,048,558—an increase of £278,970 during the twelve months. Criticizing these figures, a correspondent of the "Liverpool Post" says: "Taking the profit of 1900 as a whole, and considering that the capital expenditure has been £1,048,558, it cannot be said that something under 5 per cent. is a satisfactory return. It is much less than private companies are earning; and it is now quite clear that we have been charging too little for electrical energy. It has been admitted by the Chairman of the Tramways Committee that they have only been paying the same rate of 1·2d. per unit as before. Considering that the expenditure was 48 per cent. in 1900, against 44 per cent. in 1899, the tramways ought to have paid about £3000 more than they did; and this would scarcely represent cost, as 5 per cent. will not provide for interest, sinking fund, renewal fund, &c., in connection with the electric supply. Comment on the above is needless; he that runs may read."

At the Town Hall, Wolverhampton, last week, Lieut.-Col. A. C. Smith, R.E., a Local Government Board Inspector, inquired into an application made by the Town Council for sanction to borrow £58,942 for the purposes of electric lighting. There were present the Mayor (Mr. Hamp), the Town Clerk (Mr. Horatio Brevitt), members of the Council, and a number of officials. The Town Clerk explained that the amount asked for was required for the following purposes: Buildings and foundations, £4620; boiler-house equipment, £18,140; engine-house equipment, £19,580; feeders, distributors, and pilot mains, £15,000; and £1602 which had been overspent on a previous loan. With regard to the present power of supply, the machinery had a capacity of 640 kilowatts; but with the two sets of machines on order, together with the two sets which it was proposed to purchase, the capacity would be brought up to 2640 kilowatts. This would be necessary, as the demand for electric lighting in the borough was increasing at the rate of 33 per cent. per annum. During the year ended March 31, 1895, the total number of units sold was 23,372; and in the year ended March, 1900, it was 482,277. Now, however, the Corporation had under consideration the question of electric traction; and for this reason they were compelled to look ahead, so as to make provision for the necessary productive and storage capacity. The total amount of loans authorized was £87,669; and in respect of the loan asked for, the Corporation applied that 25 years might be allowed for its repayment. Mr. Shawfield, the Electrical Engineer, then gave evidence, and the proceedings terminated.

The electricity supply works erected by the borough of Fulham in Townmead Road, near the end of Wandsworth Bridge, were formally opened last Thursday by the Mayoress, Mrs. Cornwall. They combine an electricity generating station with a refuse destructor and a disinfector. The destructor consists of 12 cells; and it is estimated that 40,000 tons of refuse will be passed through yearly. Taking its calorific value as 1-20th that of good steam coal, this arrangement will, it is calculated, save the Borough Council the cost of 2000 tons of coal per annum. Coal, however, will also be needed. The generating plant consists of three sets of two-phase alternators, each of 300-kilowatt capacity at from 2800 to 3000 volts, and driven by a horizontal compound condensing engine of the low-speed Corliss type. Their speed is 93·7 revolutions a minute, and the frequency 50 a second. There are also three continuous-current dynamos, each coupled directly to a Musgrave enclosed high-speed engine, and three Ferranti rectifiers for use in connection with the public supply circuits. Some 36 miles of cables are already in place, and earthenware ducts have been laid for 48 miles. The high-pressure current yielded by the main alternators is transformed down at five sub-stations; and the public receive their supply at 200 volts—both single-phase and double-phase current being available for motors. The charge is to be 5d. per unit for lighting and 2½d. per unit for power; no charge being made for meter-rent. No "free-wiring" contracts have been entered into; but applications equal to about 10,000 8-candle lamps, or one-third of the total capacity, have already been received. We learn that the various contracts were entrusted to British firms, and the work carried out by British labour.

In the course of an article on "The Abuse of Electric Lighting in London," the "Architectural Review" said: "Perhaps the most remarkable illustration of modern London lighting arrangements is to be seen at Piccadilly Circus. The spectator emerges, we will say, from Wardour Street. There he has passed through half-a-mile of gloom, the street and its condition reminding him of Hogarth's London. He turns into Shaftesbury Avenue, and a minute afterwards he is in the Circus. He is in the midst of a blaze of light which is absolutely overwhelming; there is such an immense volume of it—it comes from so many sides—that it bewilders. The quality and intensity of the different lights add to the confusion; and in parts it is distressing to the eye from its excessive brilliancy. It is obvious that an enormous quantity of light—and money—is wasted in this vast agglomeration of lamps of different powers supplied by different systems. Pass away from it, if only a few steps, and all is gloom—deepened, of course, by contrast. But turn into Piccadilly, and there is some improvement. Nothing more satisfactory could be devised than the line of incandescent gas-lamps following the line of the Park, dipping as the road dips, and rising beyond towards Hyde Park Corner. If we examine the subject a little, we see that the question whether gas or electricity should be used affects it but little. Success or failure depends upon certain principles. The first is diffusion of light. It should be equable, steadily burning, and widely spread without intervening patches of darkness; it should be soft and without glare; and it should be so arranged as to follow architectural arrangements by night—the standards acting as ornaments by day. These principles are simply defied under the system of electric lighting now usually employed in London."

A Local Government Board inquiry was conducted at the Sunderland Town Hall last Thursday, by Mr. M. K. North, Assoc.M.Inst.C.E., into the application of the Corporation for sanction to borrow £73,035 for purposes of electric lighting. The Town Clerk (Mr. F. M. Bowey), after giving the usual figures relating to the population and rateable value of the borough, said that of the £73,035 asked for, all, with the exception of £18,615, was for the erection of a power station and machinery upon what was known as the Hylton Road Electric Lighting Station—a new site, in respect of the purchase of which sanction had already been given by the Local Government Board. The first station, at Dunning Street, had already been charged to its fullest capacity, and the Corporation had had to refuse customers for the light. Of course, a considerable quantity of the power was required for the electric trams; but the new station would be used solely for the production of power for lighting purposes. The loan was divided as follows: Buildings, chimney, &c., £20,950; boilers, economizers, pumps, stokers, and elevators, £9260; two 200 and three 450 horse power dynamos, £23,010; switchboard, &c., £1200; and new feeders, &c., £18,615. The Electrical Engineer (Mr. J. F. C. Snell) then gave particulars respecting the proposed new station, and read a statement showing the increase in the use of current for lighting since the station was opened in 1895. They started with 83 customers, and now they had 611, and 60 prospective consumers had been kept back, but would be taken on if the loan were sanctioned. During the half year ending Sept. 30, 1899, the Corporation sold 197,000 units; while in the corresponding half of last year the sale was 289,000 units. Since September last the sale had been 630,000 units, and when the year was completed the sale would probably have increased to 1,200,000 units. The inquiry then closed.

The new electricity generating station erected by the London County Council close to Charing Cross Station, for lighting the Victoria Embankment, was formally brought into use last Saturday afternoon by Mr. W. H. Dickinson, Chairman of the Council, in the presence of various members of that body, and of the Councils of the City and Westminster. The ceremony was performed in the engine-room by Mr. Dickinson's young daughter. The entire scheme will comprise 147 lamps—67 distributed along the parapet, and 80 on the pavement farthest from the river and across Westminster Bridge; but only about half this number were lighted up. The lights on the parapet will burn for 40 hours without attention, and, it is stated, will be of 1000-candle power. They are placed on the original gas standards; the lanterns being specially fitted with ribbed glass to improve the radiance. The lamps to be erected upon the footway and the bridge will be of about 2000-candle power each. The light was rather unsteady after the start, but it improved as the power increased. The plant includes four continuous-current dynamos, each with an output of 70 amperes at a pressure of about 500 volts. From the dynamos the current passes to a main switchboard, whence it is distributed in 15 circuits to the parapet lamps and 8 to the rest. To enable some of the lights to be extinguished at midnight, the lamps are alternately on independent circuits. The installation has cost £25,000. The dynamos are rope-driven by four 70-horse power "Stockport" gas-engines, fitted with self-starting gear and with duplicate ignition. This is the second attempt at the electric lighting of the Embankment; the first having been made, it may be remembered, in 1878, by the old Metropolitan Board of Works, when Jablochkoff "candles" were employed. The experiment was abandoned, and gas again employed; and Mr. Dickinson reminded his auditory on Saturday that "the extinction of the lamps was soon followed by the extinction of the Company which provided them, and the Board itself." With the aid of the improved appliances since introduced, their successors ought to be in a position to do something better.

Lead Contamination of Water.—In the annual report of the Medical Officer of Health for Yeadon, regret is expressed that the action of the water on the lead service-pipes continues. Some 75 samples were examined during the past year, and in one case the quantity of lead was found to be as low as 1-50th part of a grain per gallon. In the other samples, the amounts varied from 1-20th to 12-20ths of a grain; the latter quantity being found in a sample of water which had stood twelve hours in the pipe. The majority of the samples showed about 5-20ths of a grain per gallon. The Medical Officer advised the public to exercise great care in running off the water from the lead service-pipes before using any for drinking purposes, especially before, filling their teapots in the morning and evening. He pointed out that many people have the idea that if the water is boiled it is quite safe; whereas the very opposite is the case, as the original amount of lead remains in what was left in the kettle, no matter to how small a quantity the water is boiled down. In the case of lead poisoning, prevention is the plan to work upon.

METROPOLITAN WATER COMPANIES' REGULATIONS.

WESTMINSTER TOWN HALL—Monday, Feb. 18.

(*Before Mr.* C. PERRIN, M.Inst.C.E., *Chairman, Mr.* T. THOMSON, M.D., *Barrister, and Mr.* E. A. S. FAWCETT, Assoc.M.Inst.C.E.)

To-day, the proceedings connected with the Local Government Board inquiry into the above matter were resumed.

Mr. *Collins*, further examined by Mr. BAGGALLAY, said Regulation No. 33 was new. It ran: "The word 'water closet' in these regulations shall include any slop hopper and any sink used for receiving any solid or liquid excremental filth." The words from "and any sink" to the end originated with Colonel Ducat, who held the inquiry as to the 2-gallon flush in 1895, and suggested that this provision might be inserted in the regulations. No. 34 related to water-closet apparatus. It would make provision with regard to existing water-closets, cisterns, and boxes exactly on the lines of 1872, with the addition simply of the words "and maintain," which were necessary to provide that not only should the cistern or service-boxes be originally constructed properly, but maintained and worked properly; and the latter part of the regulation dealt with the water-closet flushing-cisterns or service-boxes hereafter fitted or fixed, and said the apparatus should shut off automatically, but should not start automatically. Under the old regulation, by holding or tying the pull or lever down, it was possible to make the flow practically continuous; and this it was now intended to prevent. The objection to this class of apparatus working automatically was that they were wasteful. They were so arranged that they would discharge automatically at given intervals of time—every half-hour, every ten minutes, or every five minutes, day and night. However useful this might be in the daytime, there was no use in the discharge continuing all night and on Sundays, Saturday afternoons, bank holidays, and other times when some premises might not be occupied. Further, automatic flushes were very insanitary and quite ineffective. The whole of the Thames might flow down a urinal without keeping it clean; scrubbing was required for that purpose. No. 35 was an entirely new regulation. It was intended to give effect, as regarded a number of details connected with closet and urinal service-boxes, to what had become the practice during many years in the New River Company's district. It was designed to prevent waste, to which inferior materials and bad workmanship conduced. Although a better class of fittings might cost more at the outset, they would cost less in repairs afterwards. It was to be prospective as regarded new houses, but retrospective where fittings were defective and beyond repair. No. 36 was founded on the existing regulation, and enlarged the size of water-closet down-pipes when there was a reduced flow of water. It was to be entirely prospective. The old size of pipe was still retained in ordinary cases. This rule only dealt with cases where the head was small. In No. 37, which related to the urinal service-box apparatus, the only alterations made were similar to those suggested with regard to water-closet apparatus—viz., as to the maintenance and the possibility of the apparatus being worked to give a continuous flow, and providing that the discharge should not start automatically. No. 38 prohibited the use of automatic flushing-boxes, and was wholly new. He objected even to persons supplied by measure having the right to put in an automatic flushing-box; the Company ought to have complete control of that, because the question involved was that of maintaining the water supply of London. No. 39 referred to bath apparatus, and was entirely prospective. The chief alteration was that the orifices of the inlet or inlets should be at least 2 inches above the warning-pipe or top of the bath. This was according to what was found to be good in practice. In No. 40, the only alteration was an addition so that no bath or "fixed basin" should be without an overflow-pipe. Fixed basins might be a source of waste, the same as a bath. This should be retrospective. In No. 41, the alteration was to substitute three for two as the number of days' notice of alteration of fittings. Three days was more reasonable than two. As a fact, the Company very seldom had any notice at all. No. 42 dealt with existing fittings. The latter part was new—"When any such fittings become defective, and cannot be efficiently repaired, they shall be replaced with fittings as prescribed by these regulations." The object was to make it clear that, when fittings were not efficient, the new prescribed fittings should be used; but where the existing fittings were sound and efficient, though they might not comply with the new regulations, they would be allowed to remain. No. 43, providing a penalty of £5 for violation of the regulations, was the same as the old one. No. 44 was similar to the old one, except as to a clause internally affecting the Companies, which provided the mode in which authority, approval, or consent of the Companies was to be given; the object being to prevent disputes.

Witness, in cross-examination by Mr. FREEMAN, said his attention was first drawn to the regulations in 1882; the very bad fittings in use throughout the whole of the Companies' districts having set the Engineers thinking.

Mr. FREEMAN: Was your main desire to obtain control for the Companies to regulate what the fittings should be?

Witness: Yes.

The thing particularly to which you attach importance is the power of the Company to prescribe the fittings to be used?—Yes; that is a very important point.

In further cross-examination, witness said he did not agree that, practically speaking, if they obtained this they would get all, or nearly all, they wanted. The fittings were insufficient because they allowed water to be wasted. In 1895, the Companies came practically to the conclusions now being advocated. They did not then consult the Local Authorities or consumers, except the County Council, regarding them. He knew that at the recent conference of Borough Councils, representing the whole of the Metropolis, everyone disapproved of the proposed regulations; naturally they would.

Mr. FREEMAN: And that this view was shared by the County Council naturally?

Witness: Yes.

And by the City Corporation, also naturally?—Yes.

Bodies which in the past had not agreed on every subject?—That is so.

In this case they do?—I will take that from you.

Is the object of these regulations equally for the benefit of the consumers as for the Companies?—Yes.

Then the consumers are singularly blind to their own interests?—I think they are.

You did not think it worth while to discuss the matter with them?—It never occurred to us.

Asked if it was not the fact that, although their object in drawing these regulations might not have been to increase the value of the Companies, this would be the result, witness said that, naturally, if the Companies could save waste, it would be an improvement.

Mr. FREEMAN: The Company will be in a distinctly better position if it is able to save waste?

Witness: Yes.

And if the Companies were purchased, they would get more money?—I do not think they ought to; I do not think they would. Our object is not to increase the value of the Companies, but to maintain our present value.

I have accepted your statement that that is not your object; but I point out that it is the consequence?—Yes.

Has it been brought to your knowledge that the Government have stated their intention to introduce a Bill dealing with this matter?—Yes.

Having regard to that, may I suggest that this is hardly a desirable time to furnish fresh regulations?—I think it is very desirable.

On the ground that these regulations would be equally desirable no matter in whose hands the undertakings were?—Yes.

Do you think it reasonable that you, the Water Companies' Engineers, should make certain regulations, and that, although they are disapproved of by all the authorities who presumably will form the purchasing body, you should put your regulations upon them?—We put forward regulations. They are here to be revised.

I suggest it is hardly desirable in your moribund condition that you should make fresh regulations?—We do not accept your "moribund condition."

These regulations are, at any rate, partly for the advantage of the Companies?—Yes; inasmuch as they will prevent waste. To carry them out, I agree, will cause expense.

And in no single instance do the Water Companies propose to bear one halfpenny of that expense?—No.

I suppose it is perfectly useless to ask you whether you think that is quite fair?—It is the law; and it is just.

How is it the law in respect of a thing which has not come into existence?—I mean the consumer under the present regulations has to find his own fittings.

But the consumer under the present regulations is content with the present regulations. You are going to put on him a new set. If you do that, do you think it a fair thing to make him pay for the whole?—Yes.

Although you get a good portion of the benefit?—We want to protect ourselves against waste. In certain cases the New River Company had been able to persuade 95 per cent. of the consumers in their district to accept stamped fittings approved by the Company. He denied that the Company had used a great deal of pressure to make the consumers take the fittings. A fee was charged for stamping; and there was a set of regulations framed by himself dealing with stamping.

Do you know that, notwithstanding your having these regulations, your supply is no lower per head than that of the East London?—At the present moment.

Do you know that it is not lower than the Kent Company, who equally have no such regulations?—There are conditions which alter the cases very much. The Kent Company have no filtering, and therefore do not waste any water in this way. I believe these three Companies are now supplying at about the same rate.

You think it right that the consumers should be compelled to have these new fittings, and pay for them?—Yes; they pay for the existing ones.

But they are content with the existing ones. You want them to buy new fittings to effect a saving for the Companies?—The saving of waste would be a saving to the Companies.

Supposing there is a communication-pipe which satisfies the present regulations, 60 feet long, and there is a defect of 6 inches which can be repaired for a few shillings, are you going to claim the removal of the whole 60 feet because of that slight defect?—Yes; if it is not of the prescribed weight.

You are to take advantage of the defect to put the consumer to this great expense?—Yes.

You think that is fair?—I think it is very necessary.

Why do you prescribe certain patterns of apparatus?—We think it necessary.

If you want a pattern to suit your own will, do you not think you ought to pay for it?—No.

Regulation No. 9 requires that the apparatus shall be to the satisfaction of the Company. Do you think it reasonable that you should have an absolute dictatorship in these matters, and that the man who pays should have no appeal?—I think what we are asking for is quite reasonable. There would be no objection to an appeal; and I suggest that it should be to the Court of Summary Jurisdiction.

Lord R. CECIL said what was wanted was a tribunal which should be able to say whether the fittings were satisfactory or not.

Witness, in further cross-examination, said he knew of no company having the power as to stamping and testing fittings now sought. It would be for the benefit of both Company and consumer.

Mr. FREEMAN: If it is for the benefit of the Company, why charge the whole cost to the consumer?

Witness thought it quite mutual. If the power were granted, there could be variations in patterns as among the different Companies; but most probably there would be one central station for all the Companies. Every communication-pipe he held should have a stop-valve outside the premises, in an open box accessible to everyone—a course which Counsel suggested would enable anyone who had nothing better to do to turn off the whole of the water supplies. Witness objected to certain taps produced, because they were so constructed that they could be turned off quickly. He desired to stop that, because of the concussion which resulted.

But do you not see you are establishing a perfect tyranny in the Metropolis?—No; not at all. Apart from the Special Act of the New River Company, there was no general power to require cisterns. He did not know that the Act of 1871 took away this power. He believed the Local Authorities of the Metropolis were very much against the provision of cisterns.

Asked what was to happen to an owner who removed a cistern at the request of the Local Authority, and was required to put one in by the New River Company, witness said: "It is very bad for the owner."

The CHAIRMAN: Has any authority power to order the removal of a cistern.

Mr. FREEMAN: Certainly; under the Public Health Act.

Further cross-examined: The Local Authorities in some districts had ordered the removal of cisterns. In the poorer districts they might become insanitary; so might water-closets. He did not know that in a good many large provincial towns—Belfast, Halifax, Keighley, Leeds, and Salford—they prohibited the use of cisterns; nor that in a great many other places they had been discarded. The objection of the Companies to 3-gallon flushes was that more water was used than was necessary. He believed that there were some places where the 3-gallon flush was the rule. Many pans of improper shape would not however, be flushed with 3, or even 4, gallons. The Companies had recently obtained very extensive powers with regard to intercommunication—to enable one Company to assist another; but he did not, think that was a reason for not needing a cistern. The supply to the Stock Exchange was given by meter; but, despite this, he could not make an exception in their case in regard to the fittings.

Cross-examined by Lord R. CECIL: The provision of a storage cistern would not enable the Company to return to the intermittent supply.

Tuesday, Feb. 19.

Mr. *Collins*, further cross-examined by Lord R. CECIL, said no particular kind of cistern was proposed to be used. Some householders were very careless; but that was not a main objection to storage cisterns, if properly covered. The cost of the cisterns would not be excessive—about £2 or £3 for fitting up a cistern of 150 gallons. The weight of a cistern for a 6-roomed house would be about 1100 lbs.; and for an 11-roomed house a ton. The idea of having an outlet-pipe from the cistern 1 inch above the bottom was to prevent sedimentation and deposit being consumed.

Lord R. CECIL: So you do contemplate sedimentation and deposition.

Witness: Yes; I think there may be a certain amount.

As to the flushing, that is a question on which the medical authorities and Local Authorities feel very strongly?—I believe there are some who advocate the 3-gallon flush.

Is this a matter on which the Companies are prepared to make any concession?—No; we consider 2 gallons sufficient.

You say the 2-gallon flush is enough to clear a properly constructed closet?—Yes.

In addition to clearing the closet, the flush has to clear the intercepting trap between the house drain and the sewer, has it not, to be useful?—Yes.

If it does not clear that intercepting trap, the result is a small cesspool inside?—Yes; it would be a very insanitary arrangement.

So that if you or any impartial person could be satisfied that, whatever it might do with the closet, it did not clear the intercepting trap, you would say the 2-gallon flush was insufficient?—No; I should say there was an improper trap.

Lord R. CECIL, in reply to the Chairman, said his contention was that when the drains were constructed in accordance with the regulations of the sanitary authorities, the Water Companies ought to be bound to give sufficient water to make the drains so constructed work properly. When the Legislature directed that the Companies should give a domestic supply, he suggested it was intended that the supply should be in accordance with the sanitary conditions of the day.

Witness, in further cross-examination, said he made a great number of experiments as to the efficiency of the 2-gallon flush at the time it formed the subject of inquiry before Colonel Ducat; and at the suggestion of the Court, he undertook to put in the results.

Lord R. CECIL: If cisterns have to be put up where there are none, that will cause expense. Do you not think it fair that, where extra expense is thrown on the consumer by reason of these regulations, the Companies should bear it?

Witness: No, I do not think so.

I put it to you that it would be fair to put in a provision to Regulation No. 42, to the effect that if the Companies require any existing fittings to be added to, altered, or replaced, under these regulations, and thereby put any consumer to an expense greater than would have been imposed upon him under the previously existing regulations, the Companies should repay all such additional expense, and the consumer may recover the same summarily. Would you object to any such provision?—Certainly.

Mr. MANISTY: Under the existing law, the arbiter is to be a Court of Summary Jurisdiction. Why do you suggest that the Court of Summary Jurisdiction is to be taken away and the Company substituted?

Witness: Do we take it away? Surely saying "to the satisfaction of the Company" does not preclude a man going to a Magistrate?

No; but the moment you produce evidence that you, the Company, are not satisfied, there is an end of the jurisdiction of the Magistrate. The only question he would have to determine would be whether or not the Company were dissatisfied; and once you had given evidence that the Company were not satisfied, the Justices would say you would have to go back to satisfy the Company. Do you think it reasonable to substitute for the Summary Court of Jurisdiction, which the existing law makes the arbiter, the Company?—Yes.

Do you not think it more reasonable that the patterns should be approved by the inspectors forming the present Court, acting between the consumers and the Company, rather than that the Company should be the sole arbiters of what the patterns should be?—They would have great difficulty in approving of every pattern sent out.

Mr. MANISTY, in reply to the Court, said he held that there was no power under the Act to delegate to the Companies authority to prescribe the patterns; and therefore any consumer could successfully challenge (say) Regulation No. 15, which prescribed particulars, weights, and dimensions of water-fittings to be fixed hereafter. There was nothing in the Act giving the Companies power to be the arbiter between the consumers and themselves.

Witness, in further cross-examination, said a cistern would tend to prevent waste by breaking the pressure on the small pipes, which pressure, in a high building, would be heavy.

Mr. MANISTY: With reference to the capacity of the cistern, you not only compel the consumer to have a cistern, but a cistern of minimum capacity. How do you suggest will the capacity of the cistern prevent waste; because it is only to prevent waste that you are entitled to have regulations?

Witness: We do not suggest that any particular capacity will prevent waste. We do not, however, accept the other suggestion contained in the question.

Regulation No. 42, as it stands, only exempts existing fittings which comply with the existing regulations and are sound and efficient?—Yes.

I suggest, where a man has built a house on the faith of the existing regulations, and in every respect the fittings of that house comply with the existing regulations, it would be reasonable that the building, not merely the fittings, should be exempt from the operation of these regulations?—That is our intention.

Mr. BAGGALLAY: Do you mean to go so far as to relieve that building of the necessity of having a cistern?

Mr. MANISTY: Yes.

Witness: I did not mean that. The cistern ought to be provided.

Mr. MANISTY (to witness): Do you not know there are many flats and buildings designed in which there is no space for a cistern? Is it fair, where a man has designed and erected a building, the fittings of which comply with the existing regulations, that he should be forced to incur considerable expense now to comply with a new set of regulations altogether?

Mr. PERRIN: The Companies have the right from time to time to come forward with amended regulations?

Mr. MANISTY: Yes; but the question is whether they should be retrospective. Legislation, with but few exceptions, is never retrospective.

Mr. BAGGALLAY pointed out that Parliament said the Companies might repeal existing regulations.

Mr. MANISTY: But Parliament has not said the new regulations shall affect existing buildings. With regard to these cisterns, the remarkable thing is that whereas the Act of 1872 expressly repeals the obligation to have a storage cistern at all (which was given by the Act of 1852), yet it is said that, by a regulation under the very Act, you can re-enact the provision of a cistern. (To witness:) I suggest that this regulation should be so framed as to exempt existing buildings the fittings of which satisfy the present regulations. You do not think that would be reasonable?

Witness: As regards the fittings, yes.

By Mr. RUSSELL GRIFFITHS: Where the supply was by meter, he was prepared now to say that the regulations limiting the flush to 2 gallons would not apply.

By Mr. H. SMITH: The new fittings proposed were not more expensive than the old ones.

It was strongly suggested to witness by Mr. BEVEN that there would be no room in many of the six-roomed houses in East London to place such a cistern as was required; but he said he should have to see the premises before he decided where to put it. He did not know that it could not be put in one of the rooms. He only knew by report that there were 50,000 houses in Hackney without cisterns, and that the cost of supplying them would be about £250,000.

By Mr. GLEN: Lead pipes were required under the regulations. These were not suitable for soft water; but he declined to consider this fact in connection with the bringing in of Welsh water, which was soft, as that contingency was too remote. Where there was a meter, these regulations were not to apply, because the meter itself acted as a waste preventer.

By Mr. COURTHOPE MUNROE: The Companies had not taken legal advice as to their power to make regulations.

Mr. MUNROE: With reference to Regulation No. 7, you know the practice of the Gas Companies is to bring their main into the street, and their communication-pipe into the house to the meter; and, as from the meter, the consumers' obligations begin. Can you suggest any reason why that same rule should not be put upon the Companies?

Witness: I think I can. The communication-pipes now belong to the owners of the property. If we were to take them over, we should be confiscating those pipes. If there were 12,000 houses in St. Pancras without cisterns, they had been removed illegally; and there would be no hardship in requiring them to be restored. His experience of the actual operation of closets in houses of the working classes showed that 2-gallon flushes were sufficient, where the apparatus was properly constructed, for flushing the trap and cleaning the pan. There were several forms of apparatus which were efficient.

Mr. MUNROE said his clients had examined them, and found them all equally bad.

Wednesday, Feb. 20.

Mr. *Collins*, recalled for further cross-examination, produced a list of about 100 houses or premises in Shoreditch which had been visited since the previous night, and found to answer the description which he had given of the waste which was going on. In most of the cases taps with tubs under them were running to waste.

Mr. MAYER (for the Borough of Fulham): Did the man simply go in and find a tap running?

Witness: Yes; he found it running in the yard.

Did he inquire whether all these houses were without cisterns?—We should know that from our records. I cannot say whether he asked the question.

Then how is it material; because if there were cisterns the waste goes on just the same?—I say there were not cisterns.

In further cross-examination, witness agreed that a high-service charge could be made in the New River Company's district where water was delivered 10 feet above the roadway; but if cisterns were established at that height, it was quite problematical whether the high-

service charge would be made. The New River Company did not charge for high service to a house up to £30 rateable value.

Mr MAYER: Therefore, the imposition of cisterns on all houses of a rateable value exceeding £30 would involve an extra charge for high service?

Witness: Not necessarily. They may have the high service now.

Suppose they have not got the high service now?—Well, if they have not a high service, and it was chargeable, it would be charged.

Mr. NALDRETT: May I take it that these regulations will not apply to the pipes and fittings after the meter, in cases where the supply is by meter?

Witness: That is practically our intention. The position of the cistern in small houses would have to be settled in each case on its merits.

Where water is supplied by meter, you have no objection to automatic apparatus being fixed?—No.

In further cross-examination, witness agreed that some authorities felt a strong objection to the provision that many of the requirements were to be carried out "to the satisfaction of the Company," because this ousted the jurisdiction of the Magistrates, and left the Companies alone to determine any dispute between themselves and the consumers. The liability to failure in the water supply of the Metropolis was very much lessened by the intercommunication scheme.

Mr. SNOWDEN (for the Borough of Hammersmith): Can you tell me under what Act you have power to prescribe storage cisterns, as distinguished from supply cisterns?

Witness: Under the Act of 1852.

Do you not at present possess ample powers, in the case of negligent or wilful waste, to prosecute under section 32 of the Act of 1871?—No.

The material words of the section are: "If any person supplied with water by such Company wilfully or negligently causes any fittings to be so used that the water supplied to him by such Company is, or is likely to be, wasted, he shall, for every such offence, be liable to a penalty not exceeding £5." If you are able to adduce cases where you have seen water wilfully wasted under your eyes, why have you not prosecuted?—It is very difficult to get a conviction.

By Mr. MORESBY WHITE (for the Borough of Hampstead): Regulation No. 15 said the fittings were to be stamped by the Company, for which a fee was charged; but there was misunderstanding as to who bore the cost. It really fell on the manufacturers. They made up perhaps 2000 of these taps, and sent them to the Company to be dealt with; and the cost of testing was included in the price. Eventually the cost fell on the consumer.

Mr. WHITE: We are advised that the regulation would be *ultra vires?*

Witness: No.

Can you point to any section which allows you to charge the consumer for anything except water—to charge for stamping a fitting?—I do not know of any section.

You have done it before by agreement; but you are now seeking to compel the consumer to pay for it, directly or indirectly. I suggest it is *ultra vires?*—It is a legal question.

As to cisterns, would you kindly make it clear who, if the cistern is not supplied, is liable to have proceedings taken against him for not putting it there—the owner or the occupier?—If the cistern is not there, I suppose they would be against the person who pays the water-rate. He would have to settle with his landlord.

By Mr. YOUNG (for the Borough of Wandsworth): The stop-valve on the communication-pipe was to be outside the premises for the convenience of the Company; and the Company would not object to the consumer putting one inside the premises. Every outside stop-valve was to be in the ground—in the pavement.

Mr. YOUNG: Why should you put upon the consumer the onus of breaking up a footway when he has no statutory right to do it?

Witness: The Company would break it up and put in the stop-valve.

Do you know a great many experiments were made by the Sanitary Institute with regard to the 2-gallon flush?—Yes.

And they came to the unanimous decision that it was not satisfactory?—But that was not satisfactory.

Do you dispute the accuracy of the experiments?—Yes.

They were made by very eminent persons?—Yes; but they were wrong. I think the Sanitary Institute did a great deal of harm in regard to this matter. They introduced the flat-bottom pan, which 4 or 5 gallons would not flush.

Mr. STEWART (for the Hampton Wick District Council), in reply to the Chairman, said part of his case was that, as the Companies would save by the imposition of these regulations, they should bear a portion of the expense.

Lord R. CECIL: They make that a condition of their assent.

Mr. BAGGALLAY submitted that the Local Government Board could only deal with the regulations as submitted. They might refuse some of them; but they could not make a condition which was outside the purview of the Acts.

Lord R. CECIL held that, under the Act of 1871, the Local Government Board might confirm the regulations, with such modifications as they might think proper.

Mr. FAWCETT: Do you contend that the Local Government Board can make the regulations in such form as to cast part of the cost on the Water Companies?

Mr. STEWART: You have power to reject each one of the regulations which casts on the consumers a new expense, and say that if a fitting is to be adopted, it must be adopted at the expense of the Water Companies. If the Companies effected, under the proposed regulations, a saving of only 5 gallons per head daily, it would mean a gain to them of £30,000 a year; and if the saving were increased in the same ratio as it had been effected in Shoreditch, the gain would amount to £1,000,000 in six years.

Mr. BARTLEY DENNIS, in cross-examining the witness, handed to him two taps, which witness said, so far as he could see, were identical.

Mr. DENNIS said the cost of one was 1s. 8d., and of the other, which was stamped, 2s. 2d. So that, although the fee of the Company for stamping was 2d., it became 6d. to the consumer when the stamping was done through the manufacturer.

Replying further on the question of the number of threads in the tap, witness said that it was necessary to specify the number in order that they might have something definite.

By Mr. NOAKES (a private owner of property): The consent of the Secretary, in certain cases, was to be given in writing; but witness had never heard of any instance where the consent had been withheld unless the landlord agreed to pay the water-rates, whether the premises were occupied or not.

Mr. BAGGALLAY, in re-examination: Is there absolutely no foundation for the suggestion that this proposal to alter the regulations is with a view to enhancing the value of the Companies should purchase take place?

Witness: Not the slightest.

It has been suggested that, even if it were not the intention of the Companies, the effect of these regulations might be to enhance the values. Suppose it were, would not this have the effect of handing over to the purchasing body an undertaking of enhanced value in return for the enhanced payment?—Yes; I suppose it would.

The purchasing body would get a *quid pro quo?*—Yes.

As to whether the Companies ought not in justice to bear any expense thrown on the consumers in carrying out the regulations, do I understand that the object of the regulations is to give effect to what the statute says shall be done—namely, the prevention of waste, misuse, undue consumption, or contamination of water?—That is the object.

These regulations are intended to make complete what has been so long forbidden by statute?—Yes.

And therefore to stop a loss which has been incurred by the Companies owing to the waste, misuse, and contamination?—Yes.

And therefore what these gentlemen are pleased to call a saving to the Companies is only the prevention of a loss which has been illegally going on?—That is so.

Witness, in reply to further questions, said he would accept an outside tribunal in place of the Companies to decide in case of dispute as to fittings, provided it was independent, cheap, quickly reached, and composed of competent men. He saw no reason why stamping of fittings should not be carried on by the Companies in the same way as was done in the country by local authorities. He was quite clear that a cistern was a fitting which in itself was conducive to the prevention of waste and the undue consumption of water. If a cistern were cleansed every three months, except there was special reason to the contrary, that would be sufficient to keep it clean. Some of the regulations might relate to matters dealt with by sanitary authorities; but the fact that sanitary authorities had power in regard to these things, did not relieve the Companies of their duty also to deal with them.

Mr. BAGGALLAY said he should rely, as to the 2-gallon flush, upon the proceedings in connection with the inquiry in 1895.

Mr. TALBOT said he had a number of witnesses who would advocate an alteration in the flush.

Lord R. CECIL said in Middlesex they felt more strongly upon this question than upon any other; and in the City, the feeling was quite as strong about it as about the cistern question.

Mr. COURTHOPE MUNROE entirely dissented from the position assumed by Mr. Baggallay, that, because this matter was taken up in 1895, it could not now be dealt with.

Mr. PERRIN suggested that as so much evidence had been taken in 1895, Counsel might arrange to hand that in, and call evidence in addition if they desired. This was agreed to.

Witness, in reply to Mr. FAWCETT, explained the circumstances in which the New River Company cut off water from premises, and said that it was only done after repeated warnings. Every care was taken to prevent any officer exceeding his duty in this matter. He undertook to supply a return for the year 1900, showing every occasion on which the Company cut off water, and the cause.

Some discussion followed, as a result of which it was agreed to adjourn till Thursday, Feb. 28, to enable the Engineers of the various Companies to come together and consider what modifications, in view of what had been elicited in the cross-examination of the witness, they could make to permit the legal advisers of the Companies to put the modifications into shape, and then to give time to send the modifications to the parties interested. It was suggested that this course would save much time and confusion; and Mr. Collins and Mr. Baggallay undertook to go through the regulations and consider every amendment which had been suggested.

Mr. RUSSELL GRIFFITHS especially asked Mr. Baggallay to consider the advisability of altering the regulations as to cisterns, so that the cistern should be proportionate to the number of inhabitants rather than to the number of rooms in a house.

Mr. DENNIS also begged particular consideration of his point—which had especial relation to industrial dwellings—that the requirement of cisterns should be prospective and not retrospective.

Mr. BAGGALLAY promised to give consideration to these matters.

The inquiry was then adjourned.

Ottoman Gas Company, Limited.—At the half-yearly general meeting of this Company to-day, the Directors will report that the gas-rental in the six months ending Dec. 31 amounted to £11,928, against £10,487 in the corresponding period of 1899. The net profit is £3127; and the amount available for distribution, £3868. A dividend at the rate of 7 per cent. per annum will be recommended, which will leave a balance of £1243.

Newbury Gas-Works Extensions.—In consequence of an application by the Gas Committee of the Newbury Corporation for sanction to borrow £2500, a Local Government Board inquiry, conducted by Mr. W. A. Ducat, was recently held in the Council Chamber. The Chairman of the Gas Committee (Alderman B. Smith) attended, and there were also present the Gas Manager (Mr. W. R. Davey) and the Town Clerk (Mr. F. Q. Louch). The Town Clerk explained that, under a Provisional Order obtained in 1893, the Committee were empowered to borrow £10,000. The present application, which was included in that sum, was for new mains, service-pipes, and meters; and a portion of the money had already been spent in that way. He also gave statistics of the output of gas at the works, showing their progressive character, and asked that the decision of the Board might be given before the 31st of March, which concludes the Gas Committee's year.

RHYMNEY WATER ARBITRATION.

Surveyors' Institution, London—Saturday, Feb. 9.

(*Before Mr.* C. HAWKSLEY, M.Inst.C.E., *Umpire.*)

This was the continuation of an arbitration (*ante*, p. 347) to decide the amount to be paid by the Rhymney and Aber Valleys Gas and Water Company for the domestic water portion of the business of the Rhymney Iron Company, Limited. Mr. REGINALD E. MIDDLETON was Arbitrator for the Iron Company; Mr. E. M. EATON for the Gas and Water Company.

The Hon. J. D. FITZGERALD, K.C., and Mr. C. S. ASHWORTH JAMES, appeared for the Iron Company; Mr. BAGGALLAY, K.C., and Mr. TREVOR LEWIS for the Gas and Water Company.

Mr. *W. Smith*, the General Manager of the Rhymney Iron Company, was re-called by Mr. FITZGERALD, with reference to some answers he had given Mr. Baggallay regarding the piping-in of a feeder. He explained that he was then alluding to piping-in a short length from the London and North-Western Railway Station at Rhymney Bridge to the filter-beds—a distance of 1014 feet. An estimate for the work, amounting to a little over £90, was prepared in December, 1896, before the Bill under which these proceedings were taking place was passed. There was never any intention of piping the whole distance from the well—in fact, the Iron Company would not allow the Water Company to do that.

By Mr. BAGGALLAY: These pipes were to be stoneware, and their size 15 inches. The object of piping was to prevent pollution. Although it was necessary to pipe between the railway station and the filter-beds, because of the proximity of a footpath, it was not necessary to pipe beyond the railway to the intakes, as there was no likelihood of pollution beyond the railway. The extra piping suggested would be a sheer waste of money.

This closed the evidence.

Mr. BAGGALLAY, in his address, said Mr. FitzGerald had been perfectly within his right in framing his claim as he thought fit; and as regarded questions of title, no doubt they were not for the present Court to determine. At the same time, he (Mr. Baggallay) was perfectly right in drawing attention to the doubts as to the validity or binding effect of the so-called lease, or agreement for a lease, or whatever it might be, and as to the water-rights. Mr. FitzGerald put his position concisely when he said: "I claim to be in precisely the position as if the lease had been executed, and had now a little over fifteen years to run." He (Mr. Baggallay) accepted this for the present; but that would not preclude him taking objection to any point of title when the conveyance took place. If he succeeded in any objection he took, the matter would have to be dealt with; if he failed, the award would stand. He would therefore deal with the claim as framed, and leave any question of title to be raised when the conveyance of the property was dealt with.

Mr. FITZGERALD said what he claimed was: "A leasehold interest in the Blaen Rhymney reservoir, filter-beds, service-tanks, and mains on the Bute Estate, expiring on Feb. 2, 1916; a right to abstract water during this period by means of those works and the feeder mentioned in section 43 of the Rhymney and Aber Valleys Gas and Water Act, 1898, from the Pitgwellt Brook and River Rhymney, as provided by the draft lease of 1870; and an interest in perpetuity in the mains and pipes on the Rhymney Estate."

Mr. BAGGALLAY proceeded to deal with the valuations, the basis of which he said must be the value of the undertaking to the vendor; and they must have regard to what the value had been to the owners in past years, not to what the value might be if the works were carried on in a different way as regarded rates of charge or anything else. They could not look outside the Company and see what another company, in different circumstances probably, were charging elsewhere. There was no reason to suppose the Company in question would have charged in the future any more than they were actually charging; and therefore the charges and the revenue in the past were true guides in ascertaining the value of the concern. The population in the area of supply had varied little, and was not likely to vary much in the future. Therefore the figure to start with was clearly the gross revenue; and they might assume that the revenue was not likely to be increased in the future. In the tables, the gross revenue was given as £1041, which had to be adjusted in various ways. The sum of £38 15s. 7d. for 2,326,800 gallons of water (the estimated consumption of town water for the purposes of the Iron Company) he objected to—first, because much of the water came from Brinbryth, and therefore was not included in the works which the Company were buying; and, secondly, because the quantities of water used were admittedly pure estimates, there being no evidence of the amounts supplied or consumed by the various parts of the works. This item was employed by the other side to increase the profits of the Company. The bulk of the water was allowed in respect of the brickyard boiler—360 gallons per hour for twelve hours a day, with an allowance of 500 gallons daily for miscellaneous purposes—and it was assumed that this quantity would be used for six days a week and for 52 weeks in the year. But the Manager told them the brickyard had not been working for five years, though he added that they were putting in a new boiler, and intended to work the yard again. In these circumstances, surely it was absolutely wrong to allow as if the yard were working six days a week and 52 weeks per annum. Moreover, the district was largely built up; and the Company had only fifteen years to run. Were they therefore likely to require many bricks, or a sufficient quantity to keep them going all the year through? He held that the brickyard was a bogey, and that in any case some deduction should be made for Saturday afternoons and holidays when no work was done. Having dealt with the other minor items on which the claim for £38 15s. 7d. was based, he said the whole of the sum should be disallowed, which would reduce the figure of gross water-rental from £1041 to £1003. Then came the question of what deduction should be made to ascertain the net revenue. Messrs. Strachan and Rofe said items working out to 21 per cent. of the gross revenue were sufficient. The 21 per cent. included £25 per annum paid to the Marquis of Bute in respect of the water rights; but this £25 was no part of management or maintenance, and, if deducted, would reduce the 21 per cent. to about 18½ per cent. But 18½ per cent. was quite out of the question. He could not discuss in detail what should be the proper figure. His witnesses had put it at 40 per cent. It was really a matter which must rest with the Arbitrators to decide, with the aid of their knowledge and experience of water-works. Every local concern must rest upon its own individual circumstances. But this 18½ per cent. was so out of keeping with the ordinary proportion, that the Court would necessarily look into it very carefully to see the special circumstances, if any, which justified it; and if they did not find special circumstances to justify it, they would raise it to what, having regard to all the circumstances, it ought to be. Though there might be special circumstances, yet something he claimed should be allowed for the services of the Manager, the Secretary, and even of the Directors. Criticizing the various items in the accounts, he pointed out that maintenance included nothing but portions of the wages of various workmen; and he suggested that all the items of maintenance, rents, rates, allowances for clerks, collectors, &c., should be very carefully examined. Whether or not 40 per cent. was the right figure, he could not say; but that figure was much more likely to be right than the other one of 18½ per cent. If he was right in this, the £1003 should be reduced by £401—giving £602 as the net income. Then arose the question as to the multiplier, in which it was agreed that the allowance, if any, for compulsory sale should be included. The difference between the two sides was that one took the 3 per cent. table and the other the 5 per cent. table. In other words, one side held the undertaking to be worth freehold value, the other that it was only leasehold, with certain drawbacks. He could not recollect a case where a lower table than the 3 per cent. had been used; and the 3 per cent. table was what one would adopt for the very best concern. But this was not the best possible concern. It had only fifteen years of existence before it; it was not a statutory Company; and the concern largely depended on the prosperity of some other undertaking. He submitted, therefore, that they must use the leasehold interest or 5 per cent. table, which would give a multiplier of 10·38 and produce £6248. Beyond this, Mr. Rofe, for the Iron Company, proposed to add £4961 for prospective value. That, however, was entirely unsupported; and he therefore asked the Court to disallow the whole of it. In conclusion, he said there was the matter of the piping of the feeder. To properly protect the water, the whole length of the feeder ought to be piped; and therefore, beyond the £90 of which Mr. Smith spoke, there should be a further large allowance, though not necessarily the whole £1425 at which Mr. Burstal estimated the cost.

Some conversation passed between Counsel as to the rent which the Gas and Water Company would have to pay after the transfer; and Mr. FitzGerald said that, to make the matter clear, the Iron Company would indemnify the Gas and Water Company against any claim except as to the £25 per annum.

The UMPIRE said nothing had been stated as to the possibilities of the renewal of the lease.

Mr. BAGGALLAY said he had dealt with the matter entirely as a claim in regard to a concern having fifteen years to run. If there were a claim based on the possibilities of renewal, that would alter everything, and he should have to address the Court afresh.

Mr. FITZGERALD said the only way he intended to deal with the matter was to suggest that, in finding the multiplier, they should consider that a portion of the property was freehold and that a portion was leasehold, and that if the Gas and Water Company had not intervened, inasmuch as part only of the property was freehold, the freeholders would naturally look to getting a renewal of the lease, which would enable them to utilize advantageously the freehold portion of their property; and the value of this portion would not, therefore, come to an end on the expiration of the fifteen years.

Mr. BAGGALLAY said there was no evidence of intention by the Iron Company to ask for a renewal. There was no evidence at all beyond the fifteen years; and the Court must assume that the whole thing, *qua* water undertaking, came to a finish at the end of fifteen years.

Mr. FITZGERALD, on behalf of the Iron Company, referred first to the figure of £38 15s. 7d., which the Iron Company claimed for water being supplied to the works. Mr. Baggallay objected to this, because it came from the Brinbryth reservoir, which was not being purchased. This criticism would be a complete answer to the claim, if it were true; but, as a fact, it was not. The water was not supplied from the Brinbryth reservoir, but from the works which were being purchased. Then Mr. Baggallay objected that this sum was based on estimates. That was so. So long as all the works were in the hands of the Iron Company, there was no object in measuring the quantities of water supplied to the various portions of the works; and therefore the Manager had been obliged to make an estimate. In particular, Mr. Baggallay attacked the brickyard, which he truly said had not been working for five years. But Mr. Smith had told them the old boiler had been taken out, and a new one purchased; and that it was to be used at once. In these circumstances, it was for the Court to decide whether the claim was reasonable; and he agreed that there was no allowance for half-holidays, and other possible stoppages. Mr. Baggallay said the brickyard was not likely to be used, because there was no probability of building operations. But the bricks made were not employed for that purpose. They were used chiefly for lining shafts and new galleries; and for this they were likely to be needed in large quantities. Starting with the sum of £1041 as the gross income, the next thing was to ascertain what deductions should be made. The deductions the Iron Company made amounted to 21 per cent. In considering whether this 21 per cent. was sufficient, they should remember that the water concern was in a very peculiar position—being a small portion of a large undertaking having a capital of £1,000,000; so that they were able to carry it on very much more cheaply than if it were merely an independent water undertaking connected with nothing else. Mr. Baggallay and he were agreed that the proper basis of value was the value to the Iron Company; and if the Iron Company were, in their peculiar position, able to carry it on at a much lower percentage of expenses than usual, the Court should consider that. Nothing appeared to be allowed for renewing or cleaning the sand in the filters;

and Counsel agreed that, whatever this expense might amount to, it ought to be added to the expenditure. But Mr. Baggallay went a great deal further; for he proposed that a portion of the salary of the Manager and Secretary and of the Directors' fees should be allowed. Why? Would Mr. Baggallay suggest seriously that, when this small water undertaking was transferred, the Directors would get less fees, or the Secretary or Manager a smaller salary? The question of the value to the vendors again came in. After the transfer, the vendors would have to pay these salaries exactly as if the transfer had not taken place; and therefore no allowance of the kind suggested should be made. As to the deduction for piping, if it had not been for the somewhat incorrect answers the Manager made in his examination, the Court would have heard very little of the matter; because Mr. Baggallay, early in the case, said he was not going to contend that the water after filtration was not of excellent quality. If that were so, why should any sane person propose to pipe this conduit—the effect of which would not be to improve the water, because it was admitted that it was excellent? Even the £90 mentioned by Mr. Smith should not be deducted, because, although an estimate amounting to £90 was got out for piping a portion, the work was not necessary, as was shown by the fact that the water after filtration was excellent. And, further, the Water Company had no right to pipe-in this feeder, because, under section 43 of the Act, the feeder did not pass to them. Therefore, as to the ridiculous proposal to spend £1500, he submitted that the very maximum which could be allowed was £90. As to making an addition to the capital sum in respect of the very low rates charged, he said the position of the Iron Company was very peculiar, because not only had they the water undertaking, but they were the freeholders of practically the whole of the houses supplied with water. It was thus immaterial to them, while they remained in this position, whether they derived their profit from rents of houses or from rates for water. The important matter to them was to keep their houses occupied. The policy which had apparently commended itself to the Company had been to charge a very low water-rate, by which means they had ensured their houses being occupied at a fair rent; but the moment the water undertaking passed from them, they would lose their present advantage—that advantage being a portion of the value of the concern of which they would be deprived on the transfer. When the undertaking was transferred to the Water Company, the Water Company were bound by the Act to transfer the freehold portion to the Rhymney District Council, and to supply that Council with water at the rate of 4d. per 1000 gallons. That, for 40 million gallons (the quantity required to supply 15 gallons per head daily), meant a payment by the Council to the Company of £812 per annum. Besides this, the Council would have to pay interest on the capital sum paid for the purchase of mains and pipes, and the expenses connected with the distribution of the water; and then they would naturally expect some profit. It was evident, therefore, that, in all probability, the water-rates in the hands of the District Council would be considerably above the water-rates now charged by the Company, which only produced a net sum of between £820 and £830 a year. Therefore, when the higher rates were charged, the property of the Iron Company would be affected in the way he had pointed out; and probably the Iron Company would have to reduce their rents or have a number of houses vacant. Counsel did not ask the Court to award the whole sum of £4960 claimed by Mr. Rofe; but, looking at the whole of the facts, he thought two-thirds of the sum, or £3300 roughly, should be allowed for prospective value. Turning to the question of the multiplier, he said Mr. Baggallay had contended that the undertaking was risky, unstable, and insecure. But the concern had been going on for thirty years without risk or instability; and in the fifteen years it had yet to run, was there the least reason to suppose there would be any risk, or instability, or insecurity about it? It was in about as absolutely secure a position for these fifteen years as any statutory company could be—in fact, it was in a better position than many statutory companies, in that they were the owners of practically all the property supplied by the undertaking. It had also been suggested that a different table was always taken for leasehold property. There could be no universal rule in regard to such a matter; the individual circumstances must be considered. If they were to take the 5 per cent. table, which was suggested, and then add the 10 per cent. for compulsory sale, the difference between the 5 and the 3 per cent. table would be very small indeed. Moreover, this was not entirely a leasehold property, but partly leasehold and partly freehold. He therefore asked the Court substantially to adopt Mr. Rofe's valuation, as confirmed by Mr. Strachan.

The proceedings then terminated; the Umpire reserving his award.

Llandudno Gas Profits.—An erroneous report has gone forth that the gas undertaking of the Llandudno District Council on last year's working shows a deficit of £288. So far from this having been the case, there has (the Chairman of the Committee states) been a clear profit of something like £600.

Acetylene Gas at Hawes.—The shops, houses, and streets of Hawes have been lighted by acetylene gas for about eighteen months; and report says the system has been entirely successful. The Parish Church and the Wesleyan Chapel have now adopted the light. The gas is supplied by a small Company with a capital of only £600.

Local Authorities and the Elland Gas Company's Bill.—A conference took place last Tuesday between the Directors of the Elland-cum-Greetland Gas Company and representatives of the Elland, Greetland, and Stainland District Councils, relative to the Bill which is being promoted by the Company for extension of capital account, &c. The principal points of contention were the illuminating power of the gas and the basis of the dividend. The District Councils, in the first instance, asked that the minimum illuminating power should be raised from 14 to 16 candles. In the preliminary stages of the measure, the quality had been raised to 15-candle power. The basis of the dividend was the more important point; and after the District Councils' representatives had explained their suggestions, the Directors promised to reply at an early date.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 523.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7⅓	Do. 7 p.c.	13½—14½	..	5 3 5
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	99—101	..	4 19 0
200,000	5	Nov. 14	6	Bombay, Ltd.	6—6½	..	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4—4½	..	5 6 8
380,000	Stk.	Feb. 14	12	Brentford Consolidated	258—263*	+1	4 11 3
270,000	,,	,,	9	Do. New	185—190*	+3	4 14 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—132*	..	3 15 9
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb.	113—116	+1	3 9 0
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	225—230	+2½	4 6 11
226,320	,,	,,	7	Do. A. Ord. Stk.	160—165	+7½	4 4 10
1,022,500	Stk.	Aug. 29	5	Bristol, 5 p.c. max.	121—123	..	4 1 4
420,000	20	Sept. 28	10	British	39—41	..	4 17 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c.	19—21	..	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8¼—8¾	..	6 17 2
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—100	+2	4 0 0
150,000	20	July 12	8¼	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	14—15	..	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 12	12⅔	Commercial Old Stock	277—282	..	4 10 5
236,425	,,	,,	9⅔	Do. New do.	208—213	..	4 11 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	132—137	..	3 5 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Aug. 15	5†	Crystal Palace Ord. 5 p.c.	117—122	..	4 2 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	130—135	..	3 14 1
486,030	10	Jan. 31	11	European, Ltd.	18½—19½	..	5 12 10
354,060	10	,,	11	Do. £7 10s. paid	13½—14½	..	5 13 9
15,079,885	Stk.	Feb. 14	4⅘	Gas-light and Coke — 4 p.c. Ord.	96—98*	..	4 9 9
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	87—91*	..	3 16 11
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	114—117*	+1	3 8 5
4,063,425	,,	Dec. 13	3	Gas-light and Coke — 3 p.c. Con. Deb.	92—94	..	3 3 10
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental	208—213	+3	4 13 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102*	..	3 8 8
561,000	Stk.	Aug. 30	10	Liverpool United A	232—234	..	4 5 6
678,100	,,	,,	7	Do. do. B	173—175	..	4 0 0
305,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd.	4¾—5¼	..	5 14 3
500,000	100	Oct. 1	5	Met. of — 5 p.c. Deb.	105—107	..	4 11 9
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	104—105	..	4 4 11
541,920	20	Nov. 14	3½	Monte Video, Ltd.	9½—10½	..	6 13 4
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.	220—221*	..	3 16 11
312,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	101—102	..	3 8 8
150,000	5	Nov. 29	8	Oriental, Ltd.	7—7⅓	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	5¾—6⅛	..	5 15 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
					*Ex. div.		
60,000	5	Sept. 28	7	Ottoman, Ltd.	5½—5¾	+¼	6 1 9
851,070	10	Oct. 12	7	River Plate Ord.	10¼—10½	+¼	6 10 3
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
250,000	10	Sept. 28	8	San Paulo, Ltd.	11—12	..	6 13 4
135,000	Stk.	Sept. 14	10	Sheffield A	232—236	..	4 4 9
293,984	,,	,,	10	Do. B	232—236	..	4 4 9
523,498	,,	,,	10	Do. C	232—234	..	4 5 6
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	130—133*	−2	3 15 2
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	93—96	..	3 2 6
380,940	Stk.	Nov. 14	5	Southampton Ord.	105—110	..	4 10 11
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Aug. 30	6	Tottenham — A. 5 p.c. and B. 3½ p.c.	113—118	..	5 1 8
250,520	,,	,,	4½		85—90	..	5 0 0
80,100	,,	Dec. 13	4	Edmonton — 4 p.c. Deb.	108—113	+1	3 10 10
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—102	..	4 18 0
230,000	5	Aug. 15	9†	West Ham, 10 p.c.	9—10	..	4 10 0
147,000	10	,,	6†	Do. 7 p.c.	11½—12½	..	4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb	108—113	..	3 10 10
				WATER COMPANIES.			
780,493	Stk.	Dec. 28	11	Chelsea, Ord.	298—303	+1	3 12 7
150,000	,,	,,	5	Do. 5 p.c. Pref.	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142—145	..	3 2 1
175,785	,,	Sept. 28	4½	Do. 4½ p.c. Deb.	143—148	..	3 0 10
1,720,560	Stk.	Oct. 12	7	East London, Ord.	190—195	..	3 11 10
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	145—150	−2	3 0 0
797,687	,,	,,	3	Do. 3 p.c. Deb.	94—96	..	3 2 6
700,000	50	Dec. 13	8	Grand Junction — 10 p.c. max.	109—111	−½	3 12 1
310,000	Stk.	Sept. 28	4	Grand Junction — 4 p.c. Deb.	125—130	..	3 1 7
708,000	Stk.	Feb. 14	14	Kent	298—303*	..	4 12 5
160,000	,,	,,	7	Do. New, 7 p.c. max.	209—205*	..	3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max.	285—290	−3	3 12 5
405,200	100	,,	8	Do. 7½ p.c. max.	208—213	..	3 15 1
350,000	Stk.	Sept. 28	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Feb. 14	13⅓	New River, New Shares	410—415*	..	3 6 3
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb.	127—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall — Ord.	190—195	−2	3 11 10
126,500	100	,,	7	South-wark and Vauxhall — 7½ p.c. max.	175—180	..	3 17 9
489,200	Stk.	,,	5	South-wark and Vauxhall — 5 p.c. Pref.	155—160	..	3 2 6
1,019,585	,,	Oct. 12	4	South-wark and Vauxhall — 4 p.c. A Deb.	125—130	..	3 1 7
1,155,065	Stk.	Dec. 13	10	West Middlesex	280—290	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Sept. 14	3	Do. 3 p.c. Deb.	97—99	..	3 0 7
					*Ex. div.		

† Next dividend will be at this rate.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The down main platform of the railway station at Perth has been fitted up with an installation of lighting upon the high-pressure system combined with Welsbach incandescent gas-burners. The Joint Station Committee have been in the habit of paying the Gas Commissioners fully £1200 a year for gas at 3s. 6d. per 1000 cubic feet, less 5 per cent. discount. There was some talk of introducing the electric light; and the Commissioners made an offer to fit up a high-pressure system. This was accepted; and the work has now been completed. It was done by the Welsbach Company's men and the fitters in the Perth Corporation Gas Department, supervised by Mr. W. B. M'Lusky, the Engineer. The compressors used are those of Mr. James Keith. The area where the experiment is being made embraces about 2000 square yards. It was formerly lighted with 18 pendants having 36 burners. These consumed 138·96 cubic feet, costing 5·6d. per hour, and giving a light of 432 candles, or equal to 77·14 candles per hour for 1d. There are three high-pressure lanterns, each 3 feet high, and fitted with three burners of the Welsbach high-pressure Kern type. Each lamp consumes 26·6 cubic feet per hour, and gives a light of 877·8 candles, costing 1·06d., or equal to 828 candles for a penny. Thus the area is now provided with 2633-candle power light for a cost of 3·18d. per hour; whereas under the old arrangement the light was only 432-candle power, and the cost was 5·6d. In other words, the three new lanterns give six times the light at two-thirds of the cost. The plant is worked at 8-inches pressure. The nipple in use is No. 115; and employing it with gas of 25-candle power, a magnificent result is obtained. It is possible that a smaller nipple may be fitted shortly, and the pressure could in this way be easily increased to 10 or 12 inches.

Mr. M'Lusky recently made some experiments before his Commissioners, tending to show the benefits to be derived from the use of good gas-burners, and the loss which is sustained by employing bad ones. This excellent step has already been productive of good, for the Commissioners have authorized Mr. M'Lusky to fit special burners for consumers at 1d. per burner, which covers the cost of fixing. This is an interesting development, because I presume that burners are often allowed to remain in use after their day is past, for no other reason than the trouble of getting them changed.

Mr. W. A. Chamen, the Electrical Engineer, has reported to the Electricity Committee of the Glasgow Corporation that the cost of opening streets for 2½ years from January, 1898, to November, 1900, was £74,450, and the sum paid to the Statute Labour Department for reinstating them was £22,880; making a total of £97,330. The cost of the actual main laying and of the opening and closing of streets has not been kept separately, as the same men performed both operations; and the question was further complicated by the fact that the wages paid by the Electricity Department included the construction of manholes and the laying of services to consumers' premises. Mr. Chamen estimates, however, that approximately £37,250 out of the wages paid by that department may be reckoned as the cost of opening and closing streets, which, together with the Statute Labour charges of £22,880, will make a total of (say) £60,000, which may be reckoned as the approximate cost of opening and making good the streets during the time named.

The proposal by the Corporation of Greenock to borrow £100,000 for the extension of the gas-works, gave rise to a good deal of discussion at a meeting of the Town Council this week. The Gas Committee had considered the clause in the Gas Act which requires any surplus to be carried to the general purposes of the Board of Police, and were of opinion that it should be modified so as to enable them, out of the gas profits, to establish a contingent fund, which could be used to make good any deficiency in any year, or to meet any extra expenditure which might be incurred. A motion was made that the power to borrow which should be asked should be only for £70,000; but it was not seconded. There was considerable discussion on the clause which proposes to reduce the illuminating power of the gas from 20 to 15 candles; but it was carried by 14 votes to 9. There was a general feeling against reducing the illuminating power; and the assurance was given that, although they had the authority, it was not intended to use it, but that they must adapt themselves to circumstances.

A new gasholder was inaugurated in the Stirling Gas-Works on Monday of this week. It has been erected on the site which was occupied by the Gas Manager's house and garden. It is of 300,000 cubic feet capacity, or equal to that of three existing holders. The storage accommodation is thus now a little ahead of the maximum daily make, which is always an advantage. The diameter of the tank is 102 feet. The steel work was erected by Messrs. Hanna, Donald, and Wilson, of Paisley. The cost was £8200. It is said that it was the first holder in Scotland to be riveted by pneumatic riveting tools. The ceremony of turning on the gas was performed by Mr. J. Johnston, the Chairman of the Company. At a luncheon which was given afterwards by the Gas Company, Mr. Johnston, who presided, said that in selecting a Manager to succeed Mr. Watson they had been most fortunate. Mr. J. D. Smith had a thorough knowledge of his business in every detail. The works, from designs by him, and under his supervision, had been entirely renewed; and Mr. Smith also provided the plans for the new holder. There would not, he was sure, be found anywhere a more complete plant for gas manufacture; and few works could have the same facilities for the economic handling of coal which they now had. He had been entrusted by the Directors with a pleasant duty. Mr. Smith had had a great deal of trouble in connection with the extension of the works; and, as a slight recognition of his services, the Board desired him to present Mr. Smith with a silver tray. The Directors highly appreciated his services, and had no doubt but that Mr. Smith would, in time, rise to the very highest rank in his profession. The tray bore a suitable inscription. A gold bracelet was also presented to Mrs. Smith. Mr. Smith returned thanks for the gifts.

C. & W. WALKER, Ltd.

Midland Iron-Works,

DONNINGTON, Near NEWPORT, SHROPSHIRE.

110, CANNON STREET, LONDON, E.C.

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PERFECTLY TIGHT UNDER EVERY EXTREME OF HEAT OR COLD.

THE ONLY ABSOLUTELY RELIABLE CENTRE-VALVE IN THE MARKET.

The health of the Contractors was drunk, and was acknowledged by Mr. Donald. Mr. J. Hepworth, of Edinburgh, was present; and his health was proposed by the Chairman, as one to whom the Company had been much indebted in the past. Mr. Hepworth returned thanks for the compliment.

It has turned out that the resolution of the Edinburgh and Leith Gas Commissioners, with reference to the wages and engagement of the gas workers, has not given satisfaction. But, so far as can be seen, it is not the men who are dissatisfied—it is those whose calling it is to find out "grievances" for the working classes. A meeting was held in Leith, on Thursday night, of Edinburgh and Leith gas workers, who were addressed by Mr. T. Blaikie, Mr. W. G. Hunter, Mr. T. Wilson, and Mr. W. Blackwood. A resolution was unanimously approved, and ordered to be forwarded to the Gas Commissioners, to the effect that "attention be respectfully drawn to the fact that, notwithstanding their decision of the 9th inst., to accede to winter men holidays per ratio, several have been dismissed since without any payment therefor. Further, that a definition be requested of the term workmen paid by the hour, contained in the overtime clause in recommendations of Works Committee on the 4th inst., and to all able-bodied men in the purifier clause." There is no guarantee that the meeting was one of gas workers, because the general labourer is the predominant partner in the Union. But whether it was a gathering of gas workers or not, it is significant that the meeting was held in Leith. Evidently the soil there is more favourable for the culture of dissatisfaction among workpeople than it is in Edinburgh.

The "Dundee Courier" is a newspaper always ready to expose wrongs—which is a good quality, if it is not carried to the length of assuming that to be a wrong which they do not understand. One of the objects of their exposing faculty is the Corporation Gas Department. Only a month or two ago, the paper agitated, with all the power it could, against the proposal to make the increase in the price of gas retrospective. They are at the subject again, on a slightly different ground—viz., that exorbitant charges are being made. This was mentioned at a meeting of a Ward Committee on Thursday night; and the ominous resolution seems to have been arrived at to communicate with the representatives of the various wards in the town, with the object of calling upon the Council to make inquiry into gas questions. The value to be placed upon the whole movement will be appreciated the better if I mention that the "enormity" which brought the matter up was that it was said a gas consumer had an account served upon him for 10s. 11d., and that, on going to the gas office, he got it reduced to 6s. 9d. It is trifling with public affairs to make this a subject of agitation. In the circumstances, instead of denunciation, the Gas Treasurer should have received a vote of thanks for his readiness to rectify the account.

The proposal has been made that the village of Ceres, near Cupar, should be supplied with gas from the Cupar Gas-Works. Some years ago, it was realized that the price of gas in Ceres was too high, largely owing to the cost of carting; and the Company gave up the manufacture of coal gas. Since then oil gas has been supplied; but now it is found that, on account of the rise in the price of oil, gas cannot be produced at a saleable price. The works have, in the meantime, been closed. Attention having been turned to Cupar, which is about 2 miles away, it is found that the cost of a main would require an addition to the price which is charged in Cupar; and it is doubtful then whether the sale would be sufficient to warrant the scheme being gone on with. It is still being considered.

In the First Division of the Court of Session yesterday, there was decided an action brought by the Clippens Oil Company, Limited, against the Edinburgh and District Water Trustees, with reference to the minerals in the pursuers' lands of Straiton and Pentland, through which the defenders' mains from the Pentland and the Moorfoot Hills pass. In arbitrations which were held, the Company were awarded £8079 as the value of shale and limestone to be left unworked under the water-pipes, and £2250 as the value of freestone to be left unworked. Since then the Court, proceeding upon the terms of agreements under which the land was acquired, have interdicted the Company from working the minerals from below the Pentland pipe in such a manner as to injure the pipe; and the Trustees, in the course of that process, formally undertook to pay such compensation as might be determined upon. The Trustees pleaded that the interdict relieved them of the obligation to pay compensation. The Court decided otherwise, and have given decree against the Trustees for the two sums awarded in the arbitrations, with interest and expenses, which will, together, make a sum of over £12,000. There is another action still undisposed of, in which the Company sue the Trustees for £137,000 as damages for the compulsory stoppage of their works.

Coal Prices Collapse.—The "Daily Express" last Friday said: "In their greed, the coalowners have overstepped the limits. High prices for coal involved a slackening in the iron industry, with the consequence that many of the masters shut down their blast-furnaces. To remedy this, the South Yorkshire coalowners have cut their prices for blast-furnace coke down to 10s. per ton. This is the lowest price recorded for many years, and compares with 23s. per ton last summer, at the height of the coal boom. The reduction has caused a sensation throughout the coal and iron trades; holders of contracts being badly hit. It is hoped that the new prices will save the iron industry from ruin, and enable the masters to produce pig iron at a profit."

Electrolysis of Water-Pipes in Dundee.—A report was submitted to the Dundee Water Committee last Tuesday by the Engineer as to the electrolysis of the water-mains. Recently the Committee granted authority to the Electrical Engineer to connect the negative bar of the tramway switchboard to the water-main in Lochee Road, so that it would not be necessary to provide earth plates. The Water Engineer reported that, on inquiry, he was of opinion that such connection was detrimental to the pipes; and he advised that the permission formerly given should be withdrawn. He explained that the result of the electric connection was to soften the lead at the joints, and cause pitting of the pipes. The Committee agreed to withdraw the permission.

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SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 23.

Sulphate of Ammonia.—There has been a dragging market all through the week; and the closing quotations are £10 15s. to £10 17s. 6d. per ton, delivered f.o.b. at the ports. Unfavourable weather continues to interfere with farm work; and, in the meantime, consumers are postponing their further purchasing. In spite of this, prices are fairly well maintained; the large makes having been sold in advance, and the smaller makes only requiring to be sold. The firm attitude of makers interferes with forward business; but there is speculative selling abroad at but a trifling premium on spot values.

Nitrate of Soda.—Owing to arrivals, nitrate of soda is rather easier on spot; the quotations being 8s. 3d. to 8s. 6d. per cwt., according to quality.

LONDON, *Feb.* 23.

Tar Products.—The market is quite devoid of any interest; and, although there are no changes in values of any moment, the tendency generally is to weakness. The recent spurt in pitch is dying off; and buyers are indifferent, being no doubt well covered. Few makers, however, have any more to sell for this season. Benzol is slack, and particularly 50's are neglected. Naphthas are moderately steady. Oils are weak. Naphthalene is steady at former rates. Anthracene is unsaleable. Several large contracts for tar have been let at prices quoted below—a marked contrast to those paid a year ago.

The average values obtaining during the week are: Tar, 13s. 6d. to 17s. 6d. Pitch, east coast, 31s. 6d.; west coast, 29s. Benzol, 90's, 10d. to 1s.; 50's, 10½d. Toluol, 1s. 2d. Crude naphtha, 4½d. Solvent naphtha, 1s. 1d. to 1s. 2d. Heavy naphtha, 1s. to 1s. 1d. Creosote, 1d. Heavy oils, 1⅜d. Carbolic acid, 60's, 2s. 6d. to 2s. 7d. Naphthalene, 95s.; salts, 60s. to 80s. Anthracene, "A," 3d. to 3½d.; "B," 2¼d.

Sulphate of Ammonia.—The abstention of buyers from purchasing in the meantime and the severe weather have produced a weak feeling during the past few days. A few spot lots have changed hands at £10 15s. to £10 17s. 6d. per ton, less 3½ per cent. For March delivery £11 could be obtained.

COAL TRADE REPORTS.

From Our Own Correspondents.

As our weekly Lancashire coal trade reports have for some years been supplied by the gentleman named in the following resolution, which was unanimously passed at the last monthly meeting of the Manchester Coal Exchange Committee, it may be of interest to record here the opinion entertained of him by his business colleagues: "That the Committee of the Manchester Coal Exchange have pleasure in congratulating Mr. Thomas B. Wood, who assisted in forwarding the formation of the Exchange, and who from the first has been one of its members, on the completion of twenty-five years' service as special correspondent to the coal, iron, and engineering trade journals; and take the opportunity of expressing their appreciation of the accuracy and impartial character of the market reports he has supplied, and the value of his contributions to the Press generally on commercial and other matters interesting to the trade." Subsequently this resolution was endorsed by the signatures of practically all the leading members of the Manchester Royal Exchange interested in the iron, metal, and engineering industries, and by representatives of the largest collieries in Lancashire and other districts.

Lancashire Coal Trade.—Although no official movement is at present being made with regard to prices in this district (the question having been under consideration, but adjourned for a fortnight), the position all through, except a temporary hardening in house-fire coals, is steadily becoming weaker. The severe weather of the past fortnight has, of course, largely increased the demand for house-fire consumption; and all descriptions of round coal suitable for these purposes have been moving away freely, with prices fully maintained at late rates. These range from 16s. to 17s. per ton at the pit for best Wigan Arley, 14s. 6d. to 15s. for Pemberton four-feet and seconds Arley, and 13s. 6d. to 14s. for common house coal. Other descriptions of fuel, however, are becoming more difficult to move; and the pressure of competition from outside districts is increasing. The lower qualities of round coal are just now being helped up rather by the extra inquiry for common house-fire purposes; but the demand for steam and forge requirements tends rather to decrease than otherwise, and as soon as the winter season is over there will undoubtedly be an enormous surplus of this class of fuel upon the market. Lancashire collieries are holding as firmly as they can to their prices; but these, as previously reported, have already given way considerably upon last year's maximum rates. From 11s. to 11s. 6d. per ton at the pit would represent about average figures for ordinary steam and forge coals. These prices are, however, being undercut by coal offering from other districts; and the whole tendency of the market is in the direction of still lower rates. The better qualities of engine fuel are, so far as Lancashire is concerned, fairly steady at from about 9s. to 10s. per ton at the pit, according to district and quality; but in the lower qualities of engine fuel there is a very unsettled position, owing to the extremely cheap supplies to be bought from other districts, and which are gradually creeping into the Lancashire markets at prices much below local quotations. Lancashire collieries are not quoting below 8s. to 8s. 6d. per ton for the common sorts of slack; but special parcels of Derbyshire slack have been offering at under 5s., with common Staffordshire and Yorkshire slack to be bought at 5s. 6d. to 6s. Shipping is also extremely quiet, with prices steadily easing down; 13s. to 13s. 6d. per ton being about the average rates at which ordinary qualities of steam

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coal, delivered at the ports, can now be bought without difficulty. In the coke trade, outside competition is weakening the position of local makers. Best foundry cokes are still quoted at about late rates—representing 26s. to 27s. per ton at the ovens; but Durham cokes are offering at prices which compete below these figures. In furnace qualities, local makers are quoting about 15s. per ton for good washed cokes, with common Yorkshire cokes obtainable at about 11s.

Northern Coal Trade.—There is rather more activity in the coal trade of this district; but it is unequally felt in the two great branches. In the Northumbrian coal trade, the demand has increased, and there has been a considerable amount of coal contracted for; but in the Durham coal trade the abundance of fuel rather limits dealings, and certainly has a tendency to postpone them. Best steam coals are now quoted at 11s. per ton f.o.b. for prompt delivery; while for delivery over the season, about 11s. 6d. to 11s. 9d. is now the quotation. For steam smalls the price is from 5s. to 5s. 3d. per ton. The gas coal consumption is now beginning to fall; and as the export has scarcely begun yet, there is an abundance of fuel, which weakens prices for occasional sales. While old contracts are still running at 16s. per ton, new ones are being booked at about 9s. 8d. to 9s. 9d. per ton f.o.b.; and the current quotation for best Durham gas coals is still about 10s. The coke trade is very quiet. For export, the quotation is now about 17s. to 17s. 6d. per ton f.o.b.; blast-furnace coke is about 14s. 6d. at the furnaces; and gas coke is very irregular in quotation—possibly 15s. per ton f.o.b. representing a medium price.

Scotch Coal Trade.—The most notable feature last week was the advice given by the leaders of the miners to accept the proposed reduction of wages by 1s. per day. This will clear the way for a further reduction in price. That such advice should be given, shows the straits to which the trade has been reduced. The prices quoted are: Main 9s. 9d. to 10s. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 6d., and splint 11s. 6d. to 12s. The shipments continue to go down. For the week they were 155,576 tons—a decrease of 19,438 tons upon the previous week and of 34,773 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 1,020,332 tons—a decrease on the same period last year of 174,819 tons.

Pudsey Corporation and the Gas-Works.—The Pudsey Corporation are considering the advisability of purchasing the local Gas Company's undertaking. At the last meeting of the Town Council, a proposal was on the *agenda* to ask the Company at what price they would sell their works to the Corporation. The Mayor (Alderman Stillings) described the undertaking as a very successful one in every respect; and he said he was afraid that a high figure would be named by the Company. How, therefore, was the purchase-money to be raised? The mover of the proposition admitted that the Corporation were approaching the limit of their borrowing powers; but he thought they might be able to proceed by Act of Parliament. He pointed out that the Company's profits amounted to £6000; and he considered it would be a grand thing if the Council had such a sum. A Committee was appointed to consider the matter.

Filter-Beds for Alexandria.—Alexandria draws its water from the Nile by means of the Mahmoudiyeh Canal, from which it is pumped into a smaller canal by the Water Company. The water contains certain impure matters contributed by the various villages on the canal banks, together with a considerable quantity of Nile mud, and is not adequately filtered before being delivered to the consumer. Large filters are to be constructed at a cost of £70,000 or £80,000.

Gas Progress at Goole.—Referring to the presentation to Mr. Matt. Dunn, the Manager of the Goole Gas and Water Works, mentioned in the "JOURNAL" last week, as showing the good feeling existing between him and the whole of the staff, a local paper says: "Mr. Dunn has in three years succeeded in pulling the gas undertaking round from the condition of an unprofitable to that of a profitable and revenue-earning department of the Council, and this in the face of very adverse circumstances as regards the high price of coal and materials; while at the same time there has been a reduction in the price of the illuminant of 5d. per 1000 cubic feet. The enhanced expenditure on coal is equivalent to 6d. per 1000 feet; and as the Council have not raised the price of the article, the consumers are practically getting the benefit of another 6d. All this has been accomplished without producing a deficit on the year's working. This fact alone speaks volumes for the careful and skilful management of the works. That such happy relationships exist between Manager and men augurs well for the town's interests, as it means that the men work well together without friction, and produce better results than where variances and petty jealousies are allowed to exist."

Boston (U.S.A.) Water Supply.—We learn from the "Engineering Record" that the Metropolitan Water Board of Boston have decided to commence, during the coming spring, the construction of an additional aqueduct equal to 300 million gallons per day, which will extend from the Sudbury reservoir in Southborough toward the western boundary of the Board's district. It will be about 13 miles 700 yards long. The first 3½ miles will have a slope of 1 : 1250, and the rest a slope of 1 : 5000. Substantially the same form of cross-section will be used as that of the Wachusett aqueduct built by the Board in 1896-7 The bottom and the side walls will be of natural cement concrete lined with brick, and the arch will be of portland cement concrete unlined. For the steeper slope, the aqueduct will be 9 ft. 3 in. high and 10 feet wide inside, and for the flatter slope 12 ft. 2 in. high and 13 ft. 2 in. wide. There will be four tunnels on the line, 600, 3000, 2100, and 5700 feet long respectively; the first three being in the smaller aqueduct. The first tunnel will be through compact earth, and the others through rock. Bricks will be used for lining the earth tunnel; but the rock tunnels will be lined wholly with concrete. The line of the aqueduct crosses the Sudbury River; and as the bottom of the river valley is considerably below the hydraulic gradient of the aqueduct, the crossing will be made with steel pipe-lines, about 3600 feet long. The work to be put under contract in the near future is estimated to cost between $1,500,000 and $2,000,000. A further appropriation will be needed before the other portions can be undertaken; but it is anticipated that all will be let before the end of the year.

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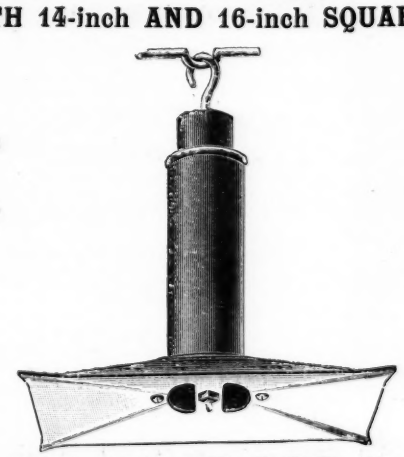

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Point under the Workmen's Compensation Act.—A question as to the exact meaning of the words "30 feet high," in the Workmen's Compensation Act, has lately arisen in Manchester. A bricklayer fell from the second storey of a building to the basement, and claimed compensation. The firm contended that the building was not 30 feet high from the street; but the County Court Judge held that the measurement should commence from the first brick—that is from the "footings." However, he reserved the point, as it was an important one.

Birmingham Gas Committee Buy American Tubes.—It transpires that, in consequence of the high price of wrought-iron tubes during last year, the Birmingham Gas Committee were unable to accept the tenders of British makers, and had to seek supplies from America. They were able to buy wrought-steel tubes from a firm in that country at considerably less cost than would have been entailed if they had been restricted to the acquisition of home material. In addition, the tubes were of very superior quality; and they have given satisfaction. The effect of these purchases was ultimately to bring down the price of British-made tubes. It is, however, stated that it is still possible to secure Staffordshire tubes which have been exported and re-shipped to this country at a less cost than they could have been procured had they been ordered direct from the makers. It should be mentioned, however, that, in connection with the Birmingham Gas Department, competition is to some extent reduced owing to the Chairman of the Committee being interested in one of the largest tube-making companies in this country. The Company are therefore precluded from contracting. In view of last year's experience, the action of British firms when the Department invites tenders within the next few weeks will be watched with interest.

Recognition of Officials' Services.—When asking the shareholders of the Ipswich Gas Company, at their annual meeting on the 18th inst., to pass a vote of thanks to the Secretary and Engineer (Mr. J. T. Jolliffe) and the staff for their services, Mr. Biddell, the Chairman of the Company, announced that, in the exercise of the power entrusted to the Directors, they contemplated in this, the first year of the new century, marking their high appreciation of those services in such a way as might seem most fitting. This generous action would, he said, not only be an incentive to their continued interest and vigilant attention to the business of the Company, but also serve as a memento of the first year of the reign of their gracious King, Edward VII. He would take the heartiness of their response as a token of their approval of their intentions. (Applause.) Such acquiescence was gratifying to the Directors, and would enhance in the eyes of the recipients the value of whatever they decided to do. Mr. A. Cornish expressed his agreement with the intentions of the Directors; and the whole meeting concurred. Mr. Jolliffe said it was very gratifying to him and the staff to know that their services were appreciated. To work with the Chairman was a delight; he buoyed them up in their troubles, and rendered every possible help. He (Mr. Jolliffe) had been with them fourteen years; and it gave him immense gratification to know that the Company had made rapid progress. Looking back over the accounts for about that time, their increase had been 116 per cent. upon the output of 1886. This showed that the business was a sound one, and that the exertions of the staff had been thoroughly appreciated and backed up by the Board. So long as this went on, he had no doubt the Company would prosper.

Liverpool Trolley-Wire Fatality.—The Liverpool Coroner (Mr. T. E. Sampson) was engaged for two days last week in further investigating the circumstances attending the deaths of Thomas Hankey and David Singleton, victims of the electric wire disaster which occurred in the city on the 4th inst., as already recorded in the "Journal." It will be remembered that on the evening of that day, during a heavy snowstorm, a group of telephone wires broke and fell across the overhead wires of the electric tramways, with the result that they became charged with electricity, and Hankey and Singleton were killed, and many person received shocks through coming in contact with the live wires. The inquest was formally opened for the purpose of identification on the 7th inst., and adjourned. Towards the close of the long inquiry, Mr. A. B. Holmes, the Electrical Engineer to the Corporation, said the city tramway system had been constructed on the advice of, and on the principle suggested by, Dr. John Hopkinson, who advised the wooden guard strip to protect the trolley wires. He (witness) considered the strip better than the wire guard; but the only safe course was to carry the wires underground. The Corporation recognized this; for since the commencement of the tramway system they had arranged with the Company that this should be done. Five hundred volts of electricity would not give a fatal, or even a dangerous, shock if the recipient were standing on dry material. The fatal results in the present case were due to the exceptional climatic conditions. Professor Henry Warren said he believed the accident was caused entirely from insufficient insulation. Major Philip Cardew, Electrical Adviser to the Board of Trade, said it was quite possible that even with the best-known guard arrangement the accident might still have happened. The real difficulty was the tendency of the telephone wires to twist into small coils and become springy. If the person entangled in an electric wire could throw himself so that the live wire could touch the ground, he would be relieved from the shock. The Coroner, in summing up the evidence, expressed the opinion that no one had been guilty of criminal negligence. The Jury decided that the two men died from electric shock; and added that if the spans between the telephone wires had not been so long, the accident would not have occurred. A verdict of "Accidental death" was returned.

If the evidence furnished by our advertisement pages week by week of the business enterprise of Messrs. Richmond and Co., Limited, is deemed insufficient, additional testimony will be found in a *brochure* which they have just issued. It is nothing less than a tastefully got-up catalogue, in French, of the numerous appliances manufactured by the Company; the different sizes of cookers being also shown on a folding plate. It is exceedingly well printed in two colours, and bound in a stiff cover, neatly lettered in gold. This effort on the part of Messrs. Richmond and Co. to bring their goods under the notice of our neighbours across the Channel is specially deserving of recognition.

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THE SUTHERLAND GAS-METER COMPANY
ESSEX WORKS, BIRMINGHAM.

The Accrington Gas and Water Board have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for a tower scrubber, 8 feet diameter and 6 feet high, and for two sets of annular condensers, the work to be carried out in accordance with plans and specifications prepared by Mr. C. Harrison, Engineer to the Board.

At the Middlesbrough County Police Court last Thursday, James Housam, a greengrocer, of Eston, was summoned by the Tees Valley Water Board for having used their water without being a customer. An inspector gave evidence to seeing the defendant get a bucketful, though Housam contended that he had drawn it from a pump. He was fined 40s., including the costs, or a month's imprisonment.

The quarterly report of the National Union of Gas Workers and General Labourers shows that the receipts for the quarter ending Dec. 31 were £6200 12s. 10d.—an increase as compared with the corresponding quarter of the previous year of £630 17s. 5d. The membership now stands at 47,979—an increase of 51. During the year 1900, the total income was £23,455 10s. 7½d.; and the year closed with a balance of £1496 17s. 11½d.

Three boys, named Thomas Paul, Frederick Davies (13), and John Harris (11), were a few days ago charged at the Manchester City Police Court with stealing money from prepayment meters. The prisoners broke into empty dwelling-houses and forced open the meters, taking the contents away. Davies was sent to a reformatory for five years, Harris was ordered to be birched, and Paul was sentenced to fourteen days' imprisonment.

An important, and at the same time lucrative, position under the Maldon Town Council is about to be filled. At the meeting of that body last Tuesday, the Finance Committee recommended the appointment of a person to give his whole time to the borough, and to act as Surveyor, Engineer and Manager of the Water Department, and Sanitary Inspector, at an inclusive salary of £180 per annum. The recommendation was adopted.

According to some tabulated statistics just published by Messrs Henry Funck and Co., the shipments of refined petroleum oil from America and Russia to various ports in the United Kingdom last year were 2,657,548 and 1,300,019 barrels respectively—together, 3,957,567 barrels. In 1899, the figures were 2,701,772 and 1,340,385 barrels—together, 4,042,157 barrels. Ten years ago, the shipments were: From America, 1,357,122 barrels; from Russia, 787,529 barrels—together, 2,144,651 barrels.

According to a telegram from Chicago to the "Daily Express," prospectors employed by the Standard Oil Company, when drilling for oil in Blackford County, Indiana, a few days ago, struck a phenomenal "gusher." The pressure was so great that the oil blew the heavy drill and the well casing to the surface and high into the air the instant the confining stratum was pierced. It is reported that the derrick was blown away by the column of oil, which shot up like a geyser. About 7000 barrels a day of the flow have been saved; but a much greater quantity is going to waste. Already a small lake of crude petroleum has been formed by the escaping fluid. The gusher which caused the oil boom in Texas a few weeks ago yielded nothing like the quantity which is pouring from the new well.

At the annual meeting of Messrs. Richmond and Co., Limited, next Thursday, the Directors will report that, including £1255 brought forward, there is a sum of £18,326 available for distribution. They propose to deal with it as follows: Dividend on the preference share capital, at 6 per cent. per annum, £2309; dividend (free of income-tax) at the rate of 10 per cent. per annum on the ordinary share capital, £3883; bonus of 2½ per cent. on the ordinary share capital, £967; shares and cash allocated to employees' profit-sharing fund, £2000; reserve fund (making the total £15,000), £2442; depreciation of buildings, plant, &c., £3212—total, £14,813. The balance to be carried forward, subject to the vote for Directors' remuneration, will be £3513. The Directors state that the past year was a most satisfactory one. In 1899 the Company had a record increase of 50 per cent. over their sales in the preceding twelve months; but last year they exceeded those of 1899. The employees participate in the Company's prosperity, and show increasing appreciation of the profit-sharing scheme. The amalgamation of the Company with the firm of Messrs. George Glover and Co., Limited, referred to elsewhere, and other matters, will necessitate additional capital; and it is proposed to create 10,000 £5 preference (6 per cent.) shares and 50,000 £1 ordinary shares—bringing the capital up to £200,000.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Payable in Advance. If credit is taken, the charge is 25s. a year.

Telegraphic Address: "GASKING, LONDON."
Telephone Number: Holborn 121.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

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Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see Feb. 12, p. 312].

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS CYCLES at Reasonable and LOW PRICES. Guaranteed and sent on approval. For Cash or Gradual Payments. Catalogue post free. Old Machines Exchanged or Repaired.
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GEORGE NUTTALL & CO., 32, Have- lock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

OXIDE OF IRON OF FINEST QUALITY.

BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.
Send for full Particulars to
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Telegrams: "BOGORE, LONDON."
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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

GASMAN seeks Situation to take charge of Small Works, or as WORKING FOREMAN. Can do own Fitting and small Repairs. Age 31. Good Reference.
A. HANCOCK, Gas-Works, Radstock, SOMERSET.

GENTLEMAN, knowing Scotch Manu- facturers well, and acquainted with the most important Gas-Works, would be glad to act as TRAVELLER to English Firm.
Address No. 3650, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation in a Gas-Works as ASSISTANT MANAGER or MANAGER. Six Years in present Situation. Well up in all Departments and keeping of Accounts. Certificates for Drawing and Gas Manufacture.
Address W. E. BROCK, Gas-Works, Sherborne, DORSET.

A GENTLEMAN who is at present REPRESENTING a large GAS-STOVE MANUFACTURER, having a sound Connection, desires to make a change, and would like to negotiate with Firm in same business.

Address No. 3647, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BRICKLAYER wanted, having experience of Inclined Retort-Settings.

Apply, stating Wages expected, to No. 3646, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-STOVE TRADE.

EXHIBITION Representative wanted. Must have thorough knowledge of Gas-Stoves, with previous Exhibition experience preferred.

JOHN WRIGHT AND CO., Essex Works, Aston, BIRMINGHAM.

WANTED, a capable all-round DRAUGHTSMAN, accustomed to Designing Gas-Stoves and Gas Apparatus. Good Salary to suitable Man.

Apply RICHMOND & CO., LTD., Gas-Stove Makers, WARRINGTON.

CAPABLE Draughtsman required, used to Constructional Ironwork. Permanency if satisfactory.

Apply, stating Age, Previous Experience, and Salary required, to SAMUEL CUTLER AND SONS, Constructional Engineers, Millwall, LONDON, E.

FOREMAN wanted for Chemical Works. Must be a steady, reliable Man, used to the Manufacture of Sulphuric Acid and Sulphate of Ammonia.

Apply, stating Age, Experience, and Wages required, to ENGINEER, Gas Company, SHEFFIELD.

ASSISTANT GAS ENGINEER.

WANTED, a practical Assistant, used to erection of Small Gas Plants and Distributing Pipe Work.

Reply, stating past Experience and Salary required, to LITE, care of Portmans Limited, 5 and 6, Clement's Inn, Strand, LONDON, W.C.

WANTED, a Clerk of Works to superintend the construction of Masonry Reservoir and the laying of Mains and Service-Pipes. Applicants to state Age, Experience, and Salary required, and to forward *copies* of not more than three recent Testimonials.

Apply, by letter, to No. 3648, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good all-round Fitter for Works in the North. One who has been accustomed to Gas-Works preferred. Must be trustworthy. Reference required. Wages 32s. per week, and Coal.

Apply, by letter, to No. 3651, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for Cape Town, a good Gas- RENTAL CLERK. Only those whose experience has been with a Company having over 2000 Consumers need apply. Commencing Salary about £3 per week.

Apply, by letter, giving full Particulars, to H. YUILL, New Broad Street House, New Broad Street, LONDON.

WANTED, second-hand Purifiers, 20 ft. by 20 ft. or 20 ft. by 30 ft. Also EXHAUSTER about 50,000 cubic feet per hour.

Offers, with full Particulars, to J. H. BROWN, Engineer and Manager, Gas-Works, ILFORD.

A SET of Four Second-Hand Purifiers wanted, with an area of not less than 190 feet each.

Offers, with full Particulars, to be sent in the first instance to No. 3603, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Offers for Four Purifiers, 12 feet square, 4 ft. 6 in. deep, with 10-inch Connections, Donkin Valves, Lifting Apparatus, &c., as fixed.

Can be seen in use by appointment, near London.

Address No. 3639, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Dorking Gas Company have for DISPOSAL 36 6-inch H DIP and ASCENSION PIPES, Six HYDRAULIC MAINS, Twelve 21 in. by 15 in. and 24 18-inch diameter Tangyes Patent MOUTHPIECES and LIDS in good condition.

The whole can be seen on application to the MANAGER.

PURIFIERS FOR SALE.

THE Waterford Gas Company, in consequence of Extensions, have FOR SALE Two 10 feet square PURIFIERS, complete with 10-inch Four-Way Valve Connections. Lutes 18 inches deep. May be inspected at the Works.

Apply to W. B. RONAN, the Company's Secretary, 94, South Mall, CORK.

TO BE LET on Hire—

PULSOMETER, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe $\frac{3}{4}$ in. diameter. Discharge 10,000 Gallons per hour.

TO BE SOLD—

EXHAUSTER for 63,000 feet per hour, with Steam-Engine, by Gwynne. In excellent condition. Replaced by 200,000 feet.

Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

GAS GOVERNORS for Sale:—

Two 1½-inch STOTT GOVERNORS.
Four 1-inch " "
Three ¾-inch " "
One ½-inch " "
One 12-horse power BRADBEAR GOVERNOR.
One 8-horse power " "
One 6-horse power " "

T. M. DAFFERN, 20, High Street, COVENTRY.

GAS-METERS for Sale:—

Three 3-light METERS.
Two 10-light "
Two 30-light "
Three 5-light "
Three 20-light "
One 50-light "

Also the following SECOND-HAND METERS:—
One 300-light METER.
One 10-light "
Two 5-light "

T. M. DAFFERN, 20, High Street, COVENTRY.

THE Corporation of Liverpool have for DISPOSAL a large number of modern 14-inch square Lamps, Copper built throughout, with plain Glass sides, and Opal Glass top, for use in Cradles or on Legs. They are in good repair; a large number of them being practically equal to new.

A sample will be sent on application. Price 7s. 6d. each at the Stores, Hood Street.

C. R. BELLAMY,
City Lighting Engineer.

Hood Street, Liverpool.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

THE Directors of the above Company will shortly be putting out of action, and have FOR DISPOSAL, Two 20,000 cubic feet per hour CIRCULAR STATION METERS, fitted with 12-inch Connections and Valves, and for which they invite offers.

Both Meters, within the last few years, have been supplied with New Drums, by Messrs. W. & B. Cowan, Limited.

The Meters may be seen in action at these Works on application for appointment to the undersigned, who will also be happy to furnish any further Particulars.

H. H. JONES,
Engineer and Manager.

Gas-Works, North Street,
Wandsworth, S.W., Feb. 15, 1901.

J. FIRTH BLAKELEY & CO., Gas Engineers and Contractors, THORNHILL, DEWSBURY, are the largest Buyers and Dealers in discarded Gas Plant, and have always a large Stock of good Plant to select from, among which the following may be mentioned:—

RETORT IRONWORK, MODERN HYDRAULICS, numerous sizes.
CONDENSERS, up to 12-inch Verticals, 16-inch Annulars.
SCRUBBERS, 3 ft. 6 in. diameter to 7 ft. diameter, with Boards.
WASHERS, "Livesey's," "Clapham's," and "Holmes'" Patents.
EXHAUSTERS, 2000 to 60,000 cubic feet per hour, with Engines.
PURIFIERS, 6 ft. to 20 ft. square.
STATION METERS and GOVERNORS, 4, 6, 10, and 12 inch.
GASHOLDERS, 12 ft. by 8 ft., 20 ft. by 10 ft., 25 ft. by 12 ft., 40 ft. by 16 ft., 50 ft. by 20 ft. guaranteed.

Photographs on Application. Inquiries Solicited. Lists sent.

Telegrams: "BLAKELEY, THORNHILL LEES."

BRISTOL GAS COMPANY.

IMPORTANT ISSUE OF
GENERAL CAPITAL STOCK
AND
NEW DEBENTURE STOCK.

GEO. NICHOLS, HOWES, YOUNG, ALDER, & CO. are instructed to SELL BY PUBLIC AUCTION, at their Sale-Room, 49, Broad Street, Bristol, on Thursday, the 21st day of March, 1901, at 2.30 p.m. precisely—

IN LOTS OF £100 EACH, OR LESS,
£25,000
FIVE PER CENT. MAXIMUM
GENERAL CAPITAL STOCK
AND
£6000
NEW DEBENTURE STOCK
(Bearing
INTEREST AT THE RATE OF FOUR POUNDS PER CENTUM PER ANNUM, payable Half Yearly in June and December),
OF AND IN
THE BRISTOL GAS COMPANY,

Issued by the Company under their Statutory Powers.

The Stocks will be Sold and Registered in the Books of the Company *Free of every Expense* to Purchasers thereof.

Full Particulars and Conditions of Sale may be obtained of the Auctioneers, 49, Broad Street, Bristol; Messrs. Brittan, Livett, and Miller, Solicitors, Albion Chambers, Bristol; or of

JOHN PHILLIPS,
Secretary.

Chief Office: Canons' Marsh, Bristol.

THE Haworth Urban District Council invite TENDERS for the supply of One or Two Thousand Tons of GAS COAL, Screened or Unscreened, delivered at Haworth Station.

Tenders to be sent to the undersigned not later than the 28th inst., endorsed "Tender for Coal."

WM. ROBERTSHAW,
Clerk to the above Council.

Burlington Buildings, North Street,
Keighley, Feb. 18, 1901.

NELSON CORPORATION.

THE Gas Committee are prepared to receive TENDERS for the supply and erection at their Brierfield Works of a LIVESEY WASHER, with Valves and Connections.

Plan and Specification, with Form of Tender and all Particulars, may be obtained on application to Mr. A. Allan, Engineer and Manager, Gas-Works, Nelson.

Tenders, endorsed "Washer," and addressed to the undersigned, must be received not later than the 7th of March, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

R. M. PRESCOTT, Town Clerk.

Town Hall, Nelson,
Feb. 18, 1901.

BOROUGH OF BRIGHOUSE.

THE Town Council are prepared to receive TENDERS for the supply of the following Stores—viz., IRONMONGERY, OIL, PAINTS, &c., WROUGHT-IRON TUBES and FITTINGS, and BRUSHES required by the Gas Committee during the Year ending March 31, 1902.

Specifications and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane Works, Brighouse.

Sealed Tenders are to be sent in on or before Wednesday, the 6th day of March, 1901, addressed to the Town Clerk, Public Offices, Brighouse.

The lowest or any Tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Public Offices, Brighouse,
Feb. 20, 1901.

URBAN DISTRICT OF NEWTON-IN-MAKERFIELD.

TENDERS FOR SUPPLIES.

NOTICE is Hereby Given, that the Urban District Council for the above-named district are prepared to receive TENDERS from persons willing to Contract for the supply of the following MATERIALS for One Year, commencing April 1, 1901—viz.,

1. Wrought-Iron Steam Tubes and Fittings.
2. Iron, Tin, Lead Piping, Bolts, Screws, Tools, and General Ironmongery.
3. Oilman's Goods, and Painting Materials.
4. Coke and Charging Shovels.
5. Water-Meters.
6. Gas-Meters—Ordinary and Prepayment.
7. Lime, Cement, Bricks, Fire-Clay, and Retorts.
8. Greases, Oils, and Engineers' Sundries.
9. Lamp Columns, Iron Castings, &c.
10. Gas-Burners, Mantles, Lanterns, and other Fittings for Lamps.
11. Gas-Fittings.
12. Water-Fittings.
13. Disinfectants.
14. Provender for Horses.

To be delivered, free of expense, within the district.

Printed Forms of Tender may be obtained from me between the hours of Nine and Five; Saturdays Nine and Twelve.

No Tender will be considered unless made strictly in accordance with, and on one of the forms issued, and the same must be sealed and delivered at the Town Hall, Earlestown, before Twelve o'clock Noon, on Friday, the 8th of March, 1901, after which no Tender will be received.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
C. COLE,
Clerk to the Council.

Town Hall, Earlestown,
Lancs., Feb. 22, 1901.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

WATER ORDER, 1898.

THE Directors of the above Company Hereby Give Notice, that a SALE BY AUCTION of FIFTEEN HUNDRED NEW ORDINARY £5 SHARES in the above Company will, under and in pursuance of the Borough of Portsmouth Water Order, 1898, take place at Messrs. Love and Cooper's Sale-Rooms, Osborne Road, Southsea, on Tuesday, the 16th day of April, 1901, at Seven o'clock in the Evening.

The above Shares, which form Part of the New Ordinary Capital authorized to be raised by the said Order, will be sold in Lots, of which the Amounts and Particulars (together with the Conditions of Sale) will be duly announced.

Dated this 14th day of February, 1901.

(By order of the Board of Directors),
J. L. WILKINSON,
Secretary to the Company.

Company's Offices:
Commercial Road, Portsmouth.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Now Ready, Fcap. Fol., 28 pp., 2 Plates, and 43 Illustrations, Bound in Duplex Paper Cover, Price 2s. 6d. net, post free.

A DESCRIPTION
OF THE
ZURICH NEW GAS-WORKS.

By A. WEISS, Engineer of the Works.

Translated from the German for, and Reprinted from the "JOURNAL OF GAS LIGHTING," &c.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Net Price: Cloth Bound, 12s. 6d.; Morocco Gilt, 18s.

GAS COMPANIES'
BOOK-KEEPING.

A Practical Treatise on the Keeping of Gas Companies' Accounts.

BY
JOHN HENRY BREARLEY & BENJAMIN TAYLOR,
OF LONGWOOD.

This Book has been very favourably reviewed in the Press; the following being examples of the notices:—

No pains have been spared by the Authors to make this book complete in every respect. The system of accounts recommended is not only a model of clearness, but also fully adequate to meet all reasonable requirements. Generally, the get-up of the book and of the various forms and specimen rulings shown therein is excellent. The work will be found both useful and reliable, while its convenience is greatly enhanced by the inclusion of an adequate index.—*The Accountant.*

The explanatory remarks are given in language that cannot be misunderstood.—*Leeds Mercury.*

We can confidently recommend this work to Accountants' students, and to practitioners desiring a reliable work on the system of book-keeping, most suitable for the accounts of Gas Companies.—*Accountants' Journal.*

Should be a useful work for Gas Companies. The work seems to us a model of exactness, simplicity, and clearness.—*Halifax Courier.*

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . .	10,500 Cubic Feet.
Illuminating Power . . .	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

The Wallsend & Hebburn Coal Company, Ltd.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

HARDMAN & HOLDEN, LD.
ESTABLISHED 1820.
SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

GAS-FITTINGS.

BURNERS
Welsbach Pattern
per 7/6 Doz.

WRITE FOR CATALOGUE.

WHOLESALE
FITTINGS COMPANY
80, Commercial Road,
London, E.

INCANDESCENT

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

BOLDON GAS COALS.

Yield of Gas per Ton. .	10,500 Cubic Feet.
Illuminating Power . .	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
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TYNE
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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE, SON, & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE;
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
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Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·78 ,,

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NITRATE of Thorium and Cerium.
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BLACK BED GAS COAL.
Prices and Analysis on application.
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HEATHCOTE GAS COAL.
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Above the **Average in Weight and Quality of Coke.**
Maintains a **High Standard in Residuals.**
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HYDRAULIC BLOWER
For blowing Air into Gas Purifiers for the purpose of
REVIVIFYING THE FOULED OXIDE.
Full Particulars on application.
LUXWERKE LUDWIGSHAFEN AM RHEIN.

WELDON MUD
FOR
GAS PURIFICATION.
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.
Full Particulars on application to the Patentees:
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— LIMITED, —
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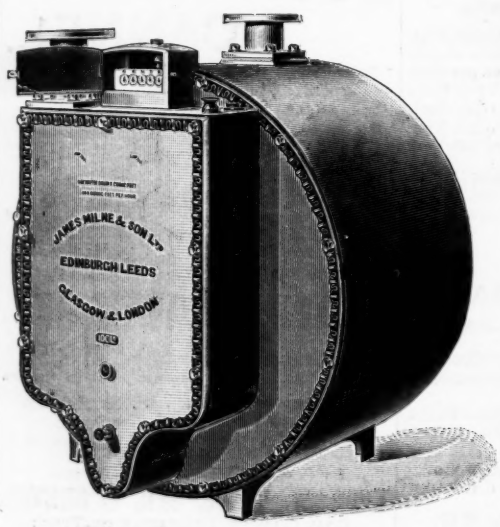
Lamp & Meter Works: HARPUR MEWS, THEOBALD'S ROAD, LONDON
MANUFACTURERS OF
OUTSIDE GAS-LAMPS
Suitable for Incandescent or Ordinary Burners.
DRY GAS-METERS, SERVICE-CLEANSERS, &c., &c.
PRICE LISTS ON APPLICATION.



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EDINBURGH.
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LARGE WET METERS
IN CAST-IRON CASES.
FLANGE OR SOCKET CONNECTIONS.
WITH OR WITHOUT FLOAT.
SUPPLIED WITH INLET AND OUTLET CONNECTIONS AT BACK IF PREFERRED.

ESTABLISHED 1873.

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GASHOLDERS

OF EVERY SIZE AND DESCRIPTION

CUTLER'S PATENT GUIDE-FRAMING

HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

Carburetted Water-Gas Plant.

SPECIAL DESCRIPTIVE CATALOGUE ON APPLICATION.

PATENT WATER-TUBE CONDENSER

Over 120 now in use.

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For keeping Cups of Gasholders free from Ice.

CHARLES HUNT PATENT GAS-WASHER.

EVERED & CO., LTD.,

27 TO 35, DRURY LANE, LONDON.
SURREY WORKS, SMETHWICK.
BARNET WORKS, BIRMINGHAM.

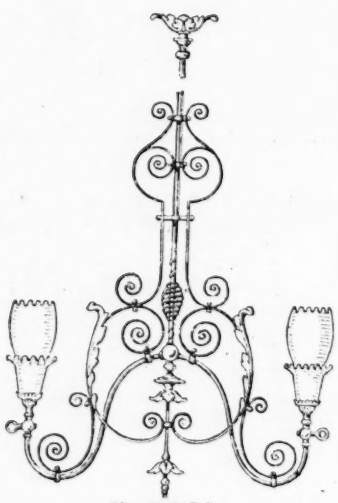
Brass Gas-Fittings Manufactory—SURREY WORKS, SMETHWICK.
Wrought-Iron Gas-Fittings Manufactory—DRURY LANE, LONDON.

A New List of

WROUGHT-IRON AND COPPER FITTINGS
FOR INCANDESCENT GAS LIGHTING

is now being issued to the Trade.

We give below a few Examples.



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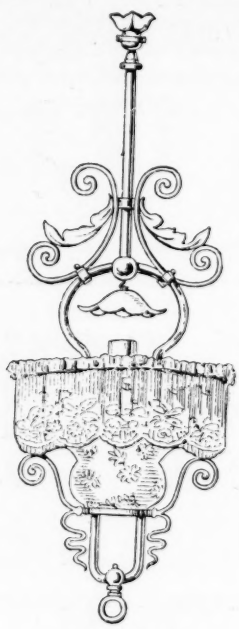

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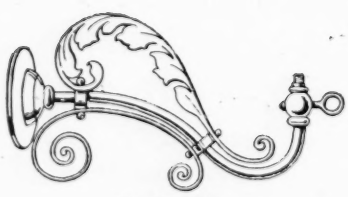
No. 1045 I.C.



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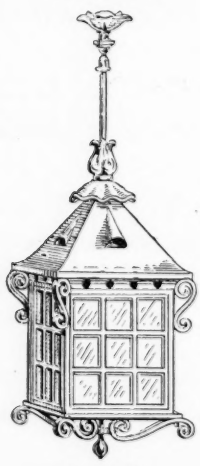

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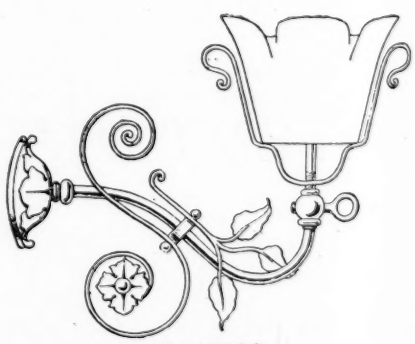

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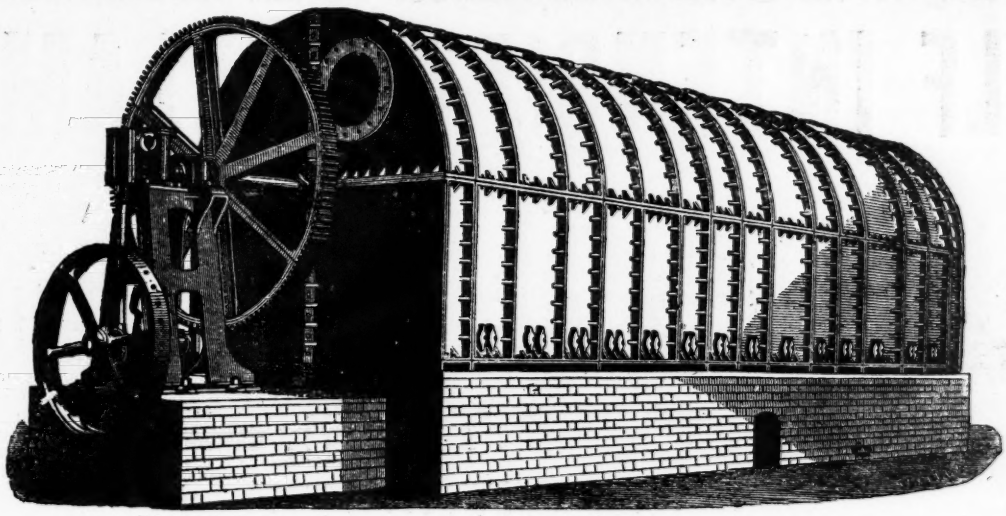
EAST-END BRANCH: 143, HIGH STREET, SHOREDITCH.

H. KIRKHAM'S PATENT "IMPERIAL" WASHER-SCRUBBER.



TESTIMONIALS.

The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, Feb. 8, 1899.

H. KIRKHAM, Esq.,

Dear Sir,—Have now made further tests with the Washer fitted with your PATENT WASHING DEVICES, and have much pleasure in reporting that *the results were highly satisfactory*; also, I ascertained that the maximum results were obtained when the machine was working at three revolutions per minute. At this speed 13 to 14 gallons of water per ton of coal carbonized were converted into 10-oz. Ammoniacal Liquor, and at same time the Gas was free from Ammonia.

Should you wish further details, I will forward them.

I am, dear Sir, yours truly,
RAPHAEL HERRING, Engineer.

The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, April 4, 1900.

Re H. KIRKHAM'S PATENT WASHER.

Please note I have much pleasure in stating that one of the above Patent Washers, 1,000,000 cubic feet capacity per 24 hours, has now been in regular action day and night for about 18 months, and is still working to our entire satisfaction.

Six months ago I examined the interior, and then found the Scrolls clean and bright, due, in my opinion, to the flushing action of the fluid rushing from inside the Scrolls.

Also when passing its maximum quantity of gas it gives the minimum of pressure.

For further Particulars see my report to Mr. H. Kirkham, Feb. 8, 1899.

Yours truly,
RAPHAEL HERRING, Engineer.

The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, Dec. 29, 1900.

H. KIRKHAM, Esq.,

DEAR SIR,—Your Washer fitted with Patent Scroll Devices was put to work Nov. 9, 1898, and has been in regular use to this date.

I am sure you will be pleased to know that the excellent results we got when this was first started are still regularly obtained.

Yours truly,
RAPHAEL HERRING.

EFFICIENCY GUARANTEED.

Estimates given for a complete set of Segments for One Wheel, or for refitting the whole number of Wheels in a Machine; also for Washer-Scrubbers complete.

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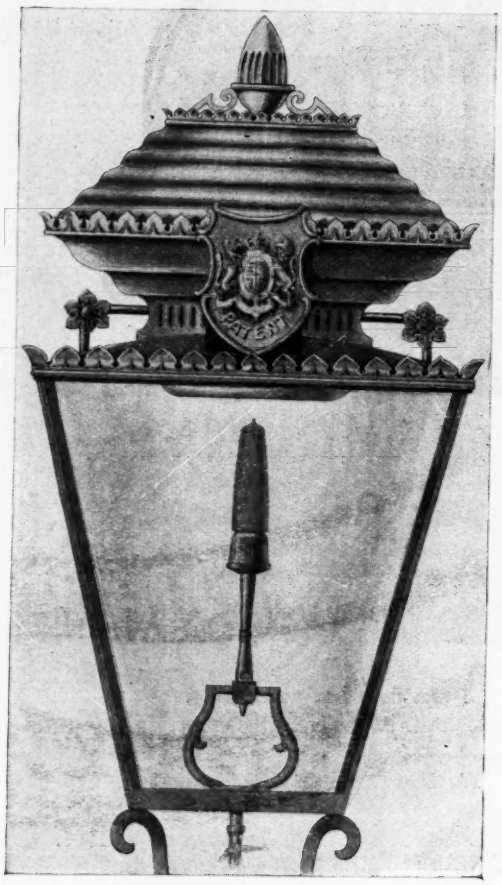
SCOTT-SNELL
SELF-INTENSIFYING LAMP.



SIZE NORMAL.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

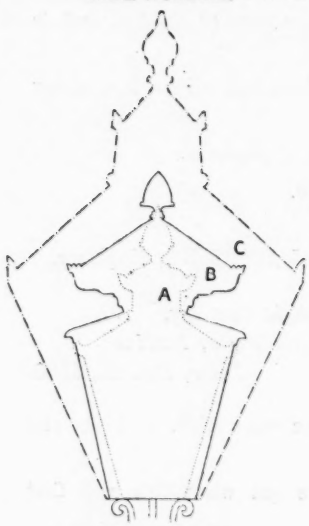
INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from **4 inches to 36 inches** of Water; **8 inches to 10 inches is usually preferred.**

400-*CANDLE POWER OBTAINED FROM A SINGLE BURNER.*

Lanterns supplied with Single, Duplex, or Cluster of Burners.



SCALE DIAGRAM.
A. Ordinary 16-inch Street Lamp.
B. Scott-Snell Self-Intensifying Lamp.
C. Ordinary Refuge Lamp.

HIGH-PRESSURE LIGHTING HAS COME TO STAY.

Orders for Trial Lamps will, as far as possible, be executed in rotation.

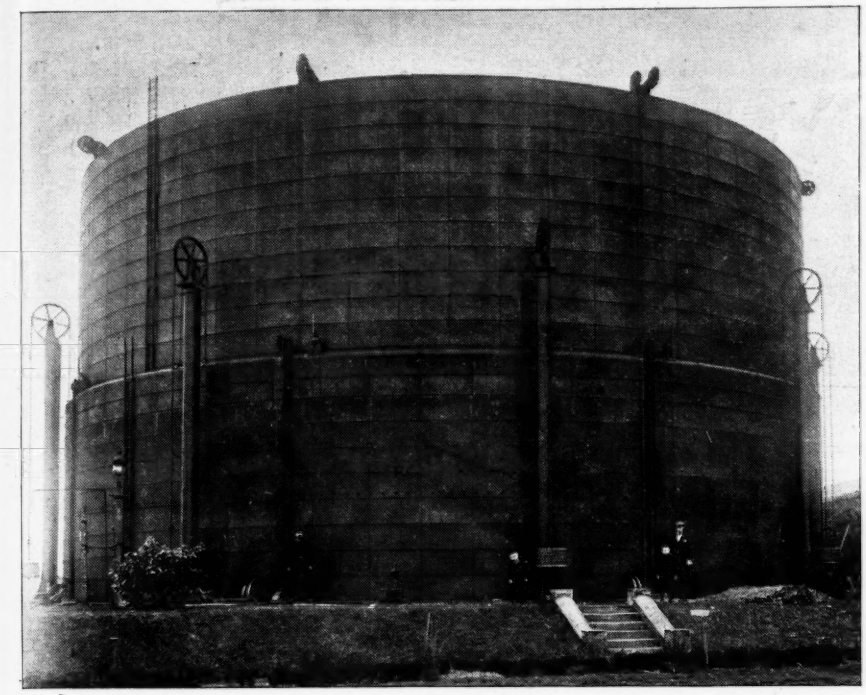
The Lamps are being made by Automatic Machinery, similar parts interchangeable, minimum of hand labour.

THE LAMPS MAY BE INSPECTED AT ANY TIME BY APPOINTMENT.

THE SCOTT-SNELL SELF-INTENSIFYING GAS-LAMP COMPANY, LTD.

Telephone No. 559 Westminster.
Works: 29, GILLINGHAM STREET, S.W.

53, Victoria Street,
WESTMINSTER, S.W.



INNER LIFT ADDED TO A SINGLE-LIFT GASHOLDER,

80 ft. diameter by 24 ft. deep. Both Lifts Cable-Guided. Counterbalance to Outer Lift on old Columns.

KIRKCALDY GASLIGHT COMPANY.

(*From a Photo.*)

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ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

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The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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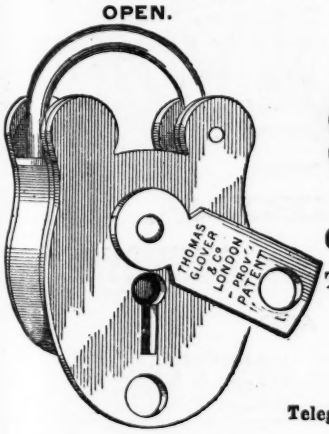

THOMAS GLOVER & CO.'S

PATENT

SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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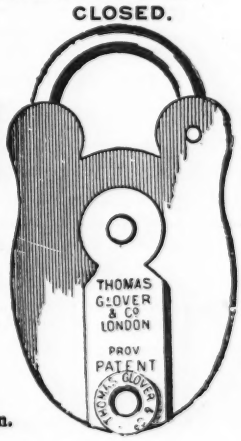

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

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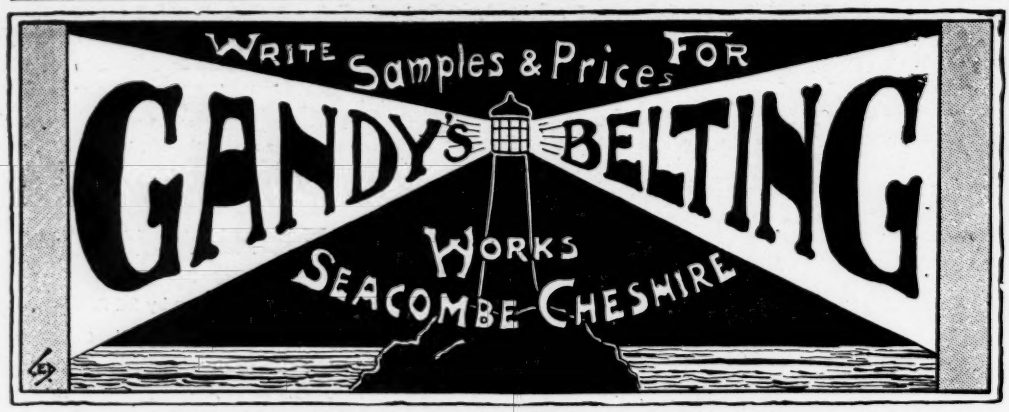
GLASGOW: 69-71, McALPINE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6197.



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Standard
Wood Split
PULLEYS.

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JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
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AND ALL KINDS OF GAS-WORKS APPARATUS,
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
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Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS
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Patent Automatic Machinery
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DRAWING AND CHARGING GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
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[See Illustrated Advertisement, Feb. 5, p. 362.]

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COMPLETED IN 12 MONTHS
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SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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SUPERHEATER
FOR SULPHATE OF AMMONIA OR OTHER PLANTS.

With this Superheater, the **Temperature of the Liquor can be raised to 190° Fahr. before entering the Still** by means of the Waste Gases only; **Steam and Fuel are saved; the capacity of the Plant is increased; the cheapest unrefined acid can be used;** and **less condensing power is required.**

Prices and Particulars on Application.

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MANUFACTURERS OF

Improved Wet & Dry Gas-Meters.

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WET AND DRY METERS REPAIRED.

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Telegrams: "HUTCHINSON BROS., BARNSLEY."

"TO GAS ENGINEERS AND MANAGERS."

BEFORE ORDERING

NEW PURIFYING PLANT

SEND FOR PARTICULARS OF

CLAPHAM'S "NEW CENTURY" COVER

WITH

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